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The Psychological Basis of Education

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THE PSYCHOLOGICAL BASIS
OF EDUCATION

The Psychological Basis of Education

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Revised Edition

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FOREWORD

THIS book is written for students in training, whether preparing for the Certificate in Education or the degree of Bachelor of Education, and for practising teachers. It is intended as a textbook for training courses and as an introduction to longer and more detailed texts for students taking further diplomas or higher degrees in education. Its objective is to provide a fairly concise account of the ideas and findings of modern psychology that are of particular use in education. Much of psychology has some bearing on this problem, and a wide field has therefore to be covered. The general method is to outline psychological results and interpretations and at the same time to consider educational uses, analogies and examples.

Four major topics are discussed : the nature of human learning (Chapters II-VI), the psychology of individual differences (Chapters VII, VIII, IX, XI), personal development (Chapters X, XII, XIII), and lastly, the relation of the individual to society (Chapter XIV). In this new edition the section on human learning has been considerably revised and brought up to date. There has been a change of emphasis from outlining learning theory to an examination of the nature of human learning and of conditions making for such learning. Chapters II, III and V have been completely rewritten. In Chapter II we discuss how the human being learns simply to respond to a stimulating situation and we emphasise the change and permanence of learning. In Chapter III we examine the fascinating field of meaningful learning, the acquisition of ideas and their use, and the long-term results of higher-level learning seen in what persists and spreads in the learner's later activity. Chapter V is given over to a discussion of the motivation of human learning which ranges from a consideration of the role of basic drives and appetites to that of curiosity and the standards set by the learner himself. Chapter VI deals with some further learning topics to which has been added a section on programmed learning.

The last two chapters (XV and XVI) are devoted to school examinations and school records. These topics embody many of the theories and facts discussed in earlier chapters. As they also belong partly to educational administration they have been dealt with at the end of the book.

Modern psychological ideas and results have been presented in their essentials, without recourse to over-elaborate detail. It is hoped, therefore, that these pages are not excessively technical and may be read by any intelligent person interested in bringing up children to be mature beings, capable of exercising their full personal responsibility in society.

CHAPTER I

EDUCATIONAL PSYCHOLOGY AND THE TEACHER

(i) *A place for educational science* (ii) *Psychology and education* (iii) *Observation and experiment* (iv) *Conclusions* (v) *Reading list* (vi) *Exercises*

(i) *A Place for Educational Science*

EVERY teacher at some time experiences a feeling of wonder when he observes the rapid rate at which learning takes place during childhood. He also needs to understand why the dull child does not readily grasp new ideas. Similarly he is at times bewildered by the promising pupil who fails to maintain progress, and develops all kinds of unacceptable outlets for his energies. What are the laws of learning? What do we know about intellectual backwardness? What is the nature of personal development? The answers to these questions are some of those which make up educational science and, imperfect though it is, educational psychology has begun to fill this explanatory role. During the last few decades its results and theories have found their way more extensively into classroom practice.

Educational science, based on rigorous research, has also an important part to play in promoting critical thinking in education. The teacher is an enthusiast in an exciting human and social field and is liable to succumb to the educational vogues of the moment. Thus we may hear excessive claims made for the teaching of social science as a means of promoting citizenship. On the other hand, some people are too ready to deprecate the value of the older humanistic disciplines in the same connection. In both cases an important factor has been overlooked, namely, that *how* one teaches and learns these subjects also matters very much. After the 1944 Act there was great enthusiasm for the so-called secondary school types. People went to extremes to justify them. Some years later comprehensive education became the burning problem with its ardent supporters and its equally vehement opponents. Finally, programmed learning has caught the attention of many in education and on its fringe. It is in many ways a direct application of psychological principles to classroom tasks.[1] Educational psychology helps us to weigh up these problems a little more objectively and with greater relevance.

Here perhaps a critic may raise his voice. Teaching, he may assert, is an art and not a science. Sixty years ago William James [2] made the distinction between the *art* of teaching and the *science* of child study. According to James it did not follow that the expert in one also excelled in the other.

Some people are endowed from the start with greater teaching potentiality than others, but nevertheless, in part, teachers can be made. Nowadays no person seriously concerned with education can afford to neglect the science of educational psychology. Child study is a prerequisite of good teaching. The real truth is that where there is an art there is also a science. The art of painting and music afford ample evidence of this truth.

The opposition has not disappeared by any means and lies at the root of the controversy between teaching a 'subject' and teaching a 'child', but the differences are now not so sharp as they were. What we do is to teach a pupil a subject. It is significant that curriculum reform needs to take some account of the findings of the research worker in educational psychology and child study.[3]

My purpose in this book is to outline the principal fields of educational psychology and to show where these touch on the work of teachers and others responsible for education.

[1] Leith, G. O. M., Peel, E. A., Curr, W., *A Handbook of Programmed Learning* (Birmingham University School of Education, 1964)

[2] James, W., *Talks to Teachers* (Longmans, 1910)

[3] Cronbach, L. J., Ch. in *Modern viewpoints on the curriculum*, Rosenbloom, P. C. & Hillestad, P. S., edit. (McGraw Hill, New York, 1964)
Bruner, J. S., *The process of education* (Harvard Univ. Press, 1960)
Ed. Fletcher, T. J., *Some lessons in mathematics* (C.U.P., 1964).
Burston, W. H., *The principles of history teaching* (Methuen, 1964)

(ii) *Psychology and Education*

Educational psychology is an applied branch of psychology. What is psychology? Psychology may be defined as the science of behaviour and experience. I include *both* behaviour and experience. *Behaviour* is just what is observed: *e.g.* the movement of a rat in a maze; the response of the baby when it is dropped; or the doings of a pupil solving a problem or carrying out a test. Observations of behaviour are objective in the sense that we may arrange to have any observation repeated or witnessed. Much of modern psychology is concerned with these observations of behaviour and with the induction of laws from them, but problems of behaviour do not constitute all that there is in psychology.

The earlier method of study was largely by introspection and subjective report. These tell us something about human *experience*; the behaviour of a person may also give some indications of his experiences, as when he gives a cry of pain in the dentist's chair. The cry is behaviour; the pain is experience. Terms like *intention*, *will* and *consciousness* are irrelevant to the science of behaviour and are not evoked in its laws. However, few would deny that the human being has experience, is conscious of sensations, conflicts, frustrations, ambitions and progress. The science of mind, or as I would prefer to call it the science of experience, may be built up on these self-observations.

It is possible to arrive at laws of experience, even though the data are subjective, existing entirely within one mind. Such would be the laws of the optical illusion or of negative after-images. The optical illusion is familiar to most, and the existence of after-images is demonstrated when we first look fixedly at a brightly coloured light or piece of paper and then stare at a grey or neutral surface. After a few seconds the shape originally stared at reappears but in the *complementary* colour. Some impressionist painters made use of this fact when they painted shadows in the colour complementary to the natural colour of the object. This had the effect of giving the picture greater vividness. The reader should note that these laws are quite independent of physiological explanation. They refer solely to events in experience.

The educational psychologist draws on such of the science of psychology as appears relevant to the aims of the educator. In a way there are as many educational psychologies as educations. If the aim of education is solely to give book knowledge, then educational psychology may concern itself primarily with the learning process, reasoning, memory and perception. If, on the other hand, we educate for character, then educational psychology will have to include more detailed studies of temperament, personality, drives and instincts.

Education is a *designed* process aimed at developing an individual. Some would say that the development is education. This is true of education in its broadest sense, involving all that goes on in life, inside and outside school. But I have purposely emphasised its designed aspect since this concerns teachers—this gives them their special function in society. This contrived feature of education is seen in the educative processes of curricula, teaching and school learning. Educational psychology relates primarily to this designed aspect, although many of its findings apply to the broader unquestioned educative process that is going on during the whole lifetime of any individual.

A person is also a member of the society in which he lives, and accordingly the social significance of educational psychology must be discussed. Wherever the *development* of the individual is studied it should be in terms of his relation to his social situation. Each person is partly the product of his social setting and all the psychological qualities of the individual are related in part to his environment. Even perception and knowledge are influenced by the social background and the interests and attitudes of the individuals. It is necessary, however, to discuss at length the qualities which make individuals different from each other.

We cannot get very far without saying what we mean by education. I shall define the aim of education as follows :

The purpose of education is to promote the development of a well-integrated person, capable of exercising such responsibility in society as his powers allow.

What are the implications of our definition for the educational psychologist ? The key terms are '*education*', '*develop-*

ment ', ' *integrated person* ', the individual's ' *powers* ' and ' *responsibility in society* '. These lead us to our broad fields of study. The word ' development ' implies mental and emotional growth—particularly during childhood and adolescence —learning and personal maturation. It implies also motivation, perception, thinking and understanding. On the reverse side there is abnormal and retarded development, failure to learn and misunderstanding. The end-product of this process of development is the ' integrated person '. We shall therefore need to study the psychology of personality.

The qualification that education develops the individual so far ' as his powers allow ' implies that individuals are differently endowed by nature and inheritance. It will therefore be necessary to study the mental differences of persons both in intellect and in temperament. We shall need also to know something of children's attainments and interests.

Lastly, we have the implications of the phrase ' responsibility in society '. Here we must know something of the social relationships of the individual to society and the smaller groups such as family, school, etc., of which he is a member. We shall need to know something about the way in which attitudes and values are formed and how the person becomes involved in social values and conduct.

Four topics emerge from this discussion : *the nature of school learning and understanding, the growth of the human personality, the differences between individuals and lastly, the study of the person in relation to society.*

The nature of school learning and understanding will involve us with both some learning theory and with experimental studies of different conditions for learning, with new methods of learning, with the quality of learning and concept learning and with curricular problems.

The study of the growth of human personality will involve the development of thinking and the maturation of emotions.

Learning and development are very closely interlocked, but it is convenient to separate them for purposes of study.

When we study *individual differences* we inquire how far persons differ from *each other.* We are interested in the range of intelligence and the dispersion of mental qualities. Individual differences refer to the psychological qualities which characterise each person.

The psychology of *social influences* is the study of the influence of social groups on individuals. It includes the environmental factors influencing the progress of the pupil—school organisation, home and class—and some personal influences shaped by society, such as the perception and motives of the pupil.

(iii) *Observation and Experiment*

Educational psychology depends for its progress on the results of objective research. As far as possible we need to improve on mere opinion and to support our contentions by data which have been carefully collected. There are three ways of getting such information : first, by the expert observation of children in their normal situations of schoolroom, play, home, etc.; secondly, by deliberately controlling the situation in order to study particular selected aspects of their behaviour, development and experience ; and lastly, by asking individuals to report their doings, wishes, attitudes, beliefs, etc.

Many will ask here whether there is an objective science of psychology in a similar sense to the science of physics. The answer is that subject to certain restrictions such a science of psychology does exist. When the research worker in psychology attempts to measure the aesthetic judgments of children by applying tests of pictorial composition, or devises intelligence tests to measure their mental abilities, he is frequently criticised for getting out of his experiment only what he has put in. In this way the critics claim to contrast mental measurement with physical measurement, ascribing to the physical measure of length some sort of 'reality' independent of the measuring operation. This turns out to be a very superficial contrast. When the physicist measures the length of a piece of material he defines length, by the method he uses to measure it, just as much as the psychologist defines intelligence by the test which he constructs, or aesthetic response by limiting himself to a particular selection of pictures or patterns.

What is important is that neither physicist nor psychologist ever 'put in' to their objects or children the *amount* of the property they are measuring. The *scales* are ' put in ' but not the quantities which different individuals or objects exhibit on the scales. Thus limiting ' intelligence ' to solving a collection of simple analogies like

black : white   up : ? (down)

no more diminishes the objectivity of knowing that John scores 120 points and Tom 80 points, than measuring across a penny and a sixpence ' puts in ' their respective diameters.

Observations in the classroom and in the more rigorously controlled tests or laboratory situations are worth while carrying out and following up. A science can be based on these observations.

(iv) *Conclusions*

Educational psychology constitutes a large part of the science of education and helps the teacher to understand the development of his pupils, their modes of thinking, the range and limits of their capacities, the processes by which they learn and their social relationships.

The other part of educational science concerns educational institutions, school organisation and curriculum study and experimentation, but even the results in these fields are judged in psychological terms—by how much has been learned and by the depth of understanding produced. Similarly experiments in school organisation are judged ultimately by their effects on the pupil's personal progress.

It may also help the teacher to preserve an impartial point of view with regard to current educational vogues.

The content of educational psychology is partly determined by the purpose of education but most of psychology has some educational application. We are concerned with four main topics :

The psychology of learning (Chs. II-VI)
The psychology of individual differences (Chs. VII-IX and XI)
The development of the mature personality (Chs. X, XII and XIII)
The relation of the individual to society (Ch. XIV)

The educational psychologist collects his data by observing children, by experimenting and by taking reports and accounts of persons' experience.

(v) *Reading List*

The reader is recommended to consult some of the following books, particularly the chapters or pages specifically mentioned.

STEPHENS, J. M. *Educational Psychology*, Ch. I (Constable, London).

CRONBACH, L. J. *Educational Psychology*, Ch. I (Harcourt, New York).

JAMES, WILLIAM. *Talks to Teachers* (Longmans, London).

BORING, E. G. *A History of Experimental Psychology*, p. 567 ff. (Appleton Century, New York, 1950).

RUSSELL, BERTRAND. *Human Knowledge*, Pt. I, Ch. VI (Allen & Unwin, London).

For general surveys of the field of psychology and accounts of its different theories the following may be read.

FLUGEL, J. C. *A Hundred Years of Psychology* (Duckworth, London).

HEIDBREDER, E. *Seven Psychologists* (Appleton Century, New York).

WOODWORTH, R. S. *Contemporary Schools of Psychology* (Methuen, London).

MURPHY, G. *Historical Introduction to Modern Psychology* (Routledge, London).

MUNN, N. L. *Psychology: The Fundamentals of Human Adjustment* (Houghton Mifflin Co., Boston, 1951).

KENDLER, H. H. *Basic Psychology* (Methuen, London, 1965).

(vi) *Exercises*

1. Observe the play behaviour of a small child for a short period. Note down the sequence of behaviour. From your notes list evidence of
   - (i) fatigue or satiation,
   - (ii) constructive play,
   - (iii) fantasy,
   - (iv) organised play.

2. Observe a small child first acquiring a skill, such as riding a tricycle, climbing stairs, opening a door, fitting pegs into holes, or imitating the skill of others. List any evidence of improvement in the skill
   - (i) which appeared to occur by chance,
   - (ii) which appeared to result from insight into the problem,
   - (iii) by imitation of others.

3. Observe a group of small children at a first meeting—it may be a party, a visit or the first day in a nursery school—and list the evidence of social interactions between the children.

4. Observe the effect of success in a task on a child's behaviour under the headings of

(i) emotional and personal results,
(ii) further activity in the task.

5. Observe a backward child in class and try to find evidence of intellectual weakness or emotional reactions to discouragement by failure.

CHAPTER II

LEARNING—CHANGE AND PERMANENCE

(i) *What is school learning?* (ii) *A working analysis of the topic* (iii) *Distinguishing between different stimuli* (iv) *Learning to respond: control of the response* (v) *Control of learning by a chain of verbal elements* (vi) *Learning a sign and producing a response* (vii) *Learning as change of behaviour* (viii) *The permanence of simple learning: frequency and practice; spacing of practice; effect of rest; extinguishing responses* (ix) *Reinforcement: the noticeable stimulus; the response; palpable consequences* (x) *Reading List* (xi) *Exercises*

(i) *What is School Learning?*

THE teacher's immediate task is to promote learning in his pupils. To do this he needs to know more than the subject he teaches. He needs also to know his pupils, how they learn and when they are ready for new stages in the subject they learn. He needs to have some idea of what the learning of, say, arithmetic or history means to the pupil. He needs to judge when he may let the pupil carry on constructively and when he himself should instruct. He needs to be able to recognise when the pupil is outpaced by the sequence of events, not just to condemn inattention without further inquiry, but to judge it in terms of the learning situation.

I have often observed children in school and at homework. On these occasions I witnessed the results of teaching—a lot of it good, most of it satisfactory and some of it not so successful. Nothing impresses me more than how important it is that a teacher should have some knowledge of the way in which a child learns. Here are two examples. One illustrates success and the other failure in teaching. Let us take the failure first, since it is in failure that one can often better see the mechanisms of learning.

One child was trying to multiply pounds, shillings and pence by such numbers as 37, 58 and 76. She had only the vaguest idea as to how to set about the calculations. I have no doubt she had been told, but perhaps not enough, perhaps not sufficiently clearly and perhaps not linked enough with earlier learning. Perhaps also she had not been made active and the task made purposeful. Lastly, perhaps there had not been enough exercise and it may not have been properly spaced. I suspected from a perusal of the child's book that homework had not been examined consistently by the teacher. If so, this was bad teaching and bad child psychology. The child was ready for these sums as a little attention from me soon showed. What was wrong?

The child had no clear idea of the real *meaning and purpose* of the sequence of operations of multiplying and reducing that began with the farthings and ended with the pounds.

She was not sufficiently *drilled in setting out* the series of long multiplications involved.

The absence of a proper layout and proficiency in it increased the *meaninglessness* of the task. She was making no progress and bringing about no *growth of experience.* She felt none of the triumph of *mastery* and fruits of *success.*

She was *frustrated* and near to the stage when she was ' leaving the field ' altogether as far as long multiplication of money was concerned. This could have *spread* to other parts of her arithmetic work.

The case of successful learning concerns a young child who had been taught at school the beginnings of number by measuring books and other school objects with a foot-rule. He had no homework to do but the effect of the teaching he had received showed itself in a spontaneous interest in measuring in the home, where he helped me make a yardstick divided into 3-inch sections which were coloured in sequences of 4—yellow, black, red and blue—to make up feet. This yardstick was intended for measuring in connection with wall-papering and interior decorating. One evening we found him using the yardstick to measure the height of the tables and chairs, the width, length and height of the sideboard and so on. He soon realised that the yardstick only measured to the nearest 3 inches, but he estimated his measurements fairly accurately to an inch. One day later he was found marking out the inches along the whole length of the yardstick and later he was able to use the yardstick to measure correctly lengths of wall-paper several times its length.

What characterises this successful learning?

First the school learning of number is based on an *activity* which is *purposive and meaningful* to the child.

It is *not too abstract* (as is counting by itself).

It *carries over* into other fields such as measuring in the home, the *construction* of a new measuring scale and the adaption of the tool to meet a new circumstance.

Exercises follow naturally and spontaneously.

The approximating leads to the idea of *subdividing.*

Measuring longer material like wall paper leads on to the concept of *multiplying.*

The *whole learning sequence* has brought with it a progression of meaningful learning.

Skill in handling the yardstick is also developed.

The fruits of *success* and *discovery* further support and enhance the whole development.

Both these examples illustrate the different elements in the learning process and situation. Some of these elements have been italicised and they include such important learning elements as *purpose*, *drill*, *exercise*, *meaning*, *activity*, *construction*, *success*, *discovery*, *progress*, *growth of skill*, *growth of experience*, *carry over*, *spread*, *adaptation.*

These ideas have been used to explain learning and in this chapter we shall explore some of them a little more fully. All are of obvious use to the teacher, but he should be clear, as a practitioner, that he cannot wholly separate learning theory from the subject taught. Our examples from arithmetic illustrate that the unit for the practising teacher is ‘ children learning arithmetic ’. This applies particularly to such elements as : *meaning*, *purpose*, *construction* and *growth of experience*. We shall discover later that what turns out to be the best method from the point of view of the learner's processes often also best serves the basic nature of the subject studied. Teachers may err in two directions. Sometimes, as in the first example of unsuccessful teaching of long division, they do not pay enough attention to the child's psychology and on other occasions as in the following quotation from C. Stern,[1] they tend to over-psychologise and produce an elaborate technique that does not do justice to the subject.

> 'It has always been the job of the educator to put abstract number relations into a concrete form which is adapted to the child's interest and his mental capacities. But while we adjust our teaching to fit the inner nature of the child, we must do so without damaging the inner nature of mathematics. Modern teaching attempts have so overdone the adjusting that the arithmetic itself is camouflaged and consequently poorly learned.'

(ii) *A Working Analysis of the Topic*

The terms listed in italics in the previous section indicate the complexity of human learning and there are several ways by which we could break down our subject-matter for more detailed study.

Let us first regard the learner as somebody who is responding to what he sees, hears, feels, etc., is going on about him. Perceptible changes in a person's environment usually result in changes in that person.

The normal child who explores all *physical objects* within reach may one day touch a hot tea-pot. This constitutes a change in his environment, and the child usually changes his behaviour in future by avoiding hot tea-pots. We say he has learned.

A child plays with his schoolmates. They constitute a *social influence* in his life, and changes in this influence, as when they express admiration or anger at his actions, are followed by related changes in the child. Here again we have learning.

The third constituent of our environment is made up of *interpersonal relationships* such as the relationship between teacher and pupil or father and son. Changes in the attitude and behaviour of the teacher or parent usually bring about changes in the experience and behaviour of the child. These changes constitute the learning associated with schooling and home influence. Book learning is an example of an indirect interpersonal relationship. The author influences his reader through the pages of his book.

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[1] Stern, C., *Children discover arithmetic* (Harrap, New York, 1948)

A person may also act as his own teacher, as when he criticises or comments upon his own performance and in consequence changes it. This suggestion that intrapersonal relations have something in common with the effect of environment on the learner needs some elaboration. First we note that a person is not just a one-response organism. Part of him can act as an editor, censor, judge or critic of his actions. He can comment upon his own responses and their significance.[1] Also the responses a learner makes to a stimulating situation are not predictable, without a knowledge of the previous experience, intellectual maturity and beliefs and attitudes of the learner.

It is clear from these examples that learning is a change in the individual following upon changes in his environment and in himself, but it would be stretching things too much if we held that *all* personal changes consequent upon environmental changes constituted learning. If a man is stunned in a car accident, it is not learning. The 'knee jerk' reflex response to a tap just below the patella is also not learning. But what of such a response as the twitching tic which may follow strain or privation? Here we begin to have doubts. We are in greater doubt still when we recall the truant, delinquent or 'nuisance' child who may have acquired his undesirable behaviour as a result of unpropitious circumstance.

The pupil's learning environment embraces everything that impinges upon his sensibilities and includes signals and instructions, whether made by others or by himself, and his own bodily and mental states. The total pattern of learned responses accounts for most of his behaviour and experience. We know that learning takes place when there is a *change* in the pattern of responses at any time, as in the improvement in, say, playing tennis, taking down shorthand, or remembering historical data. But change of response is not by itself a sufficient requirement. The change must also have some lasting quality as when one learns to swim. Once a swimmer, always a swimmer, unless there is serious impairment of body or mind by accident, disease or old age. Hence *permanence* of results is a second quality of learning. But we can further improve performance by increasing the speed, power and variety of our swimming The permanence of learning is then not inflexible for we can better it and we can re-learn. We can also unlearn but this may require hard effort if the initial learning has been well done.

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[1] Skinner, B. F., *Verbal Behaviour* (Methuen, 1962)

We may summarise so far as follows. Learning is responding to changes in our environment. Learned responses are not reflex actions, nor does learning include changes in response due to physical degeneration of response mechanisms (nor maturation in the strictest sense). The changes in the person's environment include not only what is physically outside him but also his own bodily and mental states and his observation and comment upon his own performance. Learned response patterns are more or less permanent but are flexible and admit of further change.

I have assumed so far that learning consists of making specific responses to specific stimuli and that it shows itself when existing responses are changed or new responses are made. Furthermore, these responses acquire some degree of permanence to form a basis for further change. The elements of learning listed on page 12, which seem significant in relation to this straightforward learning of certain responses to given stimuli, include those of *drill*, *exercise success*, *purpose*, *growth of skill*, *progress*. A study of these elements will form the rest of the chapter.

Most human learning, however, involves much more than making specific responses to specific situations. The human learner will change the responses and will make and invent quite new responses by virtue of his experiences and insights. He will carry over old responses to new situations and he will make new responses to old situations. He will see parallels between two or more situations and he will note similarities between different responses. This is constructive learning and involves the elements of *meaning*, *construction*, *invention*, *discovery*, *carry over* and *adaptation* (see page 12).

This more powerful and adaptive learning characterises most of school learning and takes us into the highest regions of human learning. We shall look at it more closely in Chapter III.

The method of studying learning in these two chapters will be to draw on illustrative material from school and similar situations and to use this material to introduce theoretical views about the mechanisms of learning where they appear. This illustration and interpretation of different aspects of learning will be supported, where possible, by a brief mention of relevant psychological experiments and their results to enable us to examine the conditions under which such learning takes place.

Let us now leave the general analysis of our subject-matter and look at what is involved in learning to make more or less permanent changes in response patterns, limiting ourselves to cases when these responses are made specifically to definite stimuli, as in learning to read or to spell. We study specific responses to specific stimuli.

First we shall note that the learner has to distinguish between and identify different stimuli, as in recognising different shapes, letters, colours, sounds, etc. Then we consider how he learns to make specific responses to these stimuli. Next we look at learning as changing responses and the conditions for giving these changes some degree of permanence. Appropriate examples are those of skills and of learning to speak a foreign language. Then we shall look at forgetting and the disappearance of learned responses. Lastly we shall consider the central condition for simple learning to take place. It is called reinforcement.

(iii) *Distinguishing between Different Stimuli*

Clearly the capacity to distinguish between different stimuli is of prime importance in school learning, as in whether a letter is *b* or *d*, whether a word is *steal* or *steel*, or whether a mathematical expression is

$$[2a-3(a+2)-1]$$

or

$$[2a-3(a+2-1)]$$

or whether in, say, oral German the teacher has said *stadt* or *staat*. An important part of the teaching and learning processes consists in making clear the distinguishing differences between perceived stimuli. It is generally believed that the capacity to distinguish between two stimuli at the perceptual level is not capable of great change by practice. Indeed, such pairs are sometimes used in tests of basic intelligence.

Very often the learner has to identify a stimulus when there is no other stimulus present with which he may compare it. Thus he may have to judge whether a particular red is magenta, crimson, scarlet or vermilion He learns to do this by placing the unknown red on a scale which he has experienced and remembered, and for which he has learned names to identify certain points as magenta, crimson, etc. Both ways of distinguishing stimuli : discriminating between two stimuli and identifying one stimulus on a memorised scale, are important not only for those learning to read and listen to language and mathematics but also for pupils in science lessons where relatively small changes of colour and shape have such great significance.

The teacher can help the pupil to distinguish between stimuli by using every device to make their differences noticeable. He may not be able to improve the pupil's basic sensory discrimination, but he can contrive in the teaching situation to make sure his words, tables, diagrams are clear, well defined and striking. Where the differences in the stimuli are small and beyond his control—as in some chemical, physical and biological phenomena and experiments, he can help by bringing in other stimuli for matching purposes, by drawing attention to what the pupil is looking for and by identifying the differences in terms of language. In part this would lead us to the meaning of stimuli and this is better considered in the next chapter and in Chapter IV, where we shall consider learning as insight.

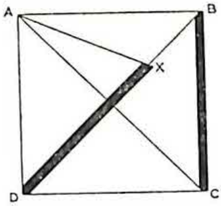
(iv) *Learning to Respond ; Control of the Response*

Given that the learner can distinguish between stimuli and can identify and recognise stimuli, learning in the simplest sense consists of reacting to the stimuli by making responses which are not built-in reflex actions. In a simple situation a car driver has to learn to press the foot-brake when the traffic light is on the red, to ease off it on the orange and step on the accelerator on the green. Similarly, in a branching programmed learning text the pupil quickly learns to respond to the paging instructions which take him on his course through the programme and the person learning to pronounce French gradually learns to respond correctly by echoing his instructor's pronunciation.

Learning has to be precise but there are many responses a person might make to many stimuli. Thus he may be learning to pronounce a new language and in this case would have to make a repetitive or echoic response, as in learning to echo the teacher's spoken *Wo* in German. When he is learning to read a text he is making a spoken or implicitly spoken response to the printed marks on a piece of paper. When he is learning to count, one, two, three, four, etc., he is making a chain of responses, each link of which depends upon the previous stimulus which itself began in him as a response. More significant examples of such intra-verbal training are of course the sentences the child learns when first learning his own language, *The door is closed*, or when learning a foreign language such as German, exemplified in a question like, *Was für früchte verkaufen Sie?* When he is carrying out an intelligence test and has to do an ' opposites ' item he has to respond to the stimulus ' black ' by the response ' white '.

How does the learner make the correct, precise response? This comes about by the particular *control* exercised upon the responder by the total stimulating situation. Precision of learning leads to the idea of responding under control. The learner makes his responses, when learning a foreign language, learning to solve mathematics problems, and even in creative writing, under some controlling aspect of the stimulating situation. In learning Russian, with the marked dependence of its phonetics upon accenting, (gorod=gáwrad) and its unusual consonant sounds (xleb=chlyep), the learner's first responses must be made under strong oral control from the teacher or from pronouncing rules. Later, the meaning of the word takes over, *gorod=town*, *xleb=bread*. This control may be exercised by discrete translation or by the Russian context in which the word is placed, as would be done in the direct method of teaching Russian. Still later, linguistic and semantic elements may exercise an influence on response. The learning of the word *dom*, *house*, is controlled by context in *brat v dome*, *ony ne doma* (my brother is in the house, they are not at home) and by linguistic parallels in *domus*, *domicile*, etc.

Our problem in teaching is to be sure that the situation controlling the response is the one which promotes the learning and understanding we require. More often than not the learning difficulties of the pupil, and certainly his thinking difficulties in problem solving, may be traced to lack of control rather than lack of stimuli and lack of responses. Thus if we present the following problem in geometry



where we have a square, ABCD and a line AX constructed by bisecting angle CAB and we ask the pupil to show how the lines BC and XD are related, we are placing the inexpert thinker in a position where he has great difficulty in determining which control shall take over to set up the chain of responses leading to solution.

(v) *Control of Learning by a Chain of Verbal Elements*

When a young child learns first to spell out a word,

P — R — E — V — I — O — U — S

the first letter-saying response—saying ' P '—is set off by the teacher's instruction, ' Spell *previous* '. Each other letter-saying response is controlled by the letter spoken immediately before it. Even when the pupil acquires commonly recurring sequences of letters like *PRE* or *IOUS* the sequences are controlled in a similar way by the chain. In learning to speak a sentence there is a similar chain control of the responses. What words we have already said determine much of what follows. This process is nowhere more clear than in learning to speak a foreign language where the word order is different from English. Here is a case from German :

> Am folgenden Morgen setzte ich meine Reise fort (I continued my journey the next morning).

By such chain control the learner builds up larger sequences of letters (words) and also larger sequences of words (phrases and sentences). Finally, in the writing of prose, sequences of sentences (paragraphs) are controlled by previous paragraphs in relation to the goal of the total composition. The important thing for us to remember is that just as spelling has to be learned, sentences, and even blocks of sentences, are also learned. We assemble these sequence units differently when we have to solve unlearned problems—but the units are learned in the earlier stages. This is true even in an arithmetical process or a mathematics solution. The pupil learns to carry out the process of long division :

$$\begin{array}{r@{}l}
 & 252 \\
17/ & \overline{4298} \\
 & 34 \\
 & \overline{89} \\
 & 85 \\
 & \overline{48} \\
 & 34 \\
 & \overline{14}
\end{array}$$

Answer : 252, remainder 14.

by the stages set out above.

The stages in finding the value of x when

$$x-[x-4(x-2)]=3x-5$$

are as follows :

$$
\begin{aligned}
x-[x-4(x-2)]&=3x-5\\
x-x+4(x-2)&=3x-5\\
x-x+4x-8&=3x-5\\
4x-8&=3x-5\\
4x-3x&=-5+8\\
x&=3
\end{aligned}
$$

I may have omitted certain of the links in these two sequences, but from the lay-out provided it is clear that each sequential procedure has first to be learned before it can be extended to fresh calculations or new problems.

The pupil's efficiency in these new situations depends much upon his having learned certain sequences and being drilled in setting them out properly Often this need to learn such sequences is neglected.

In the programmed learning of spelling, grammar, arithmetic and mathematics, special attention is given to learning correct sequences (see Chapter VI, Section (v)).

(vi) *Learning a Sign and Producing a Response*

Now that we have briefly considered the two extremes of the learning process, the learning and distinguishing of the stimulus, and the making of a response, we can turn to study two fundamental ways of human learning. We may easily identify these two basic learning processes in the classroom.

First, much of learning consists of recognising signs and symbols and their meanings. Thus, we learn to recognise new words in foreign languages and our own. Similarly, we learn the signs we call chemical formulae and equations, and the special system of signs and symbols of mathematics. Also, we learn those things which signify pleasure, anxiety, hope, and even fear.

But to recognise these signs is not enough. Learning becomes effective and proceeds to advance more rapidly, when we know how to use these signs ourselves, as responses to situations which call for solution. Thus the pupil who has learned to recognise the word *pomme* makes his learning much more effective when he can produce the spoken or written response *pomme* in conversation or writing. Similarly, the

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learner of chemistry or mathematics is becoming really efficient only when he can use chemical and mathematical symbolism in order to account for new phenomena and to produce new proofs and solutions. When the learner is able to produce a response to a new stimulus situation, then we can say he is producing a problem-solving response.

These, then, are the two basic learning processes : learning a sign and learning to produce a response.

Let us first look at sign learning a little more closely. On the surface, when we learn the sign *pomme* for *apple*, we may be doing no more than accepting an instruction from the teacher (to control the response), but there is more to it than this. We do this kind of learning by responding to the sign in some such way very slightly resembling the response we would make to what it signifies. Thus our reaction to the fruit, apple, is complex and involves sight, smell, taste (for salivation and eating) and kinaesthetic sensations (for weight and texture). When we learn the French word *pomme* as a sign for apple some very small part of this complex apple-response becomes attached to the sign *pomme* so that when on some later occasion we read or hear the word *pomme* we react in a way that to some small extent shares with the reaction we should make to an actual apple.

The other form of sign recognition seen in the education of the emotions mentioned above can be illustrated by the way in which two children may react to arithmetic—one with pleasure because he is successful—the other with anxiety because he fails. We assume they can make characteristic pleasure or anxiety responses. When things go well in arithmetic it becomes a sign for pleasure. If things persistently go badly it becomes a sign for anxiety, and if there is a lot of unpleasantness over the failure on the part of the teacher or parent, then arithmetic may become the sign for fear.

Sign learning and training of the emotions are examples of *classical* conditioning, as first demonstrated in Pavlov's experiments with dogs. A new stimulus is learned which sets off part of the response previously attached only to the old.

Let us now look at response learning. On the surface, sign learning might appear to be more important in language learning, whether it is a foreign language or a new system of symbolism in mathematics or chemistry. This is not so, for, once we have established a very few new signs, learning proceeds much more rapidly when we have to use these signs ourselves, as *responses* to situations which call for solution.

Such response-learning (as opposed to the first learning of stimuli or signs) is called *operant* or *instrumental* learning, because by making the response the learner provides the instrument by which a problem is solved. We may put the difference between these two kinds of human learning as follows : All human communication as made by others consists of signs, but as made by ourselves, communication means producing keys for solving problem situations. The difference is also that between recipient learning and definitely active constructive learning. The difference also partly resembles that between instruction by the teacher (teaching signs) and construction by the pupil (in producing answers, working out exercises, writing essays, doing homework and performing practical laboratory tasks).

All enlightened forward moving teaching endeavours to promote the second kind of learning. It is the basis of the direct method of teaching foreign languages,[1] of active methods of learning and teaching mathematics and science.

Here is an instance from teaching French. The object of the lesson is to introduce the comparatives of adjectives and to enable the pupils to use the phrase *plus . . . que*. The adjectives *grande*, *petite*, *maigre* and *grasse* are known and the lesson begins from drawings of Mme X who is *grande et maigre* and her aunt who is *petite et grasse*.

The sentences *Mme X est grande et maigre* and *Sa tante est petite et grasse* are evoked from the pupils. The teacher then says and writes, *Mme X est plus grande que sa tante, mais sa tante est plus grasse que Mme X.*

This is sign learning as far as the pupils are concerned but the teacher immediately changes the learning situation so that the phrase *plus . . . que* has to be used by the pupils as a problem solving response by asking, *Est-ce que Mme X est plus petite que*

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[1] Leith, G. O. M., Peel, E. A., Curr, W., *A Handbook of Programmed Learning*, Chap. II, pp. 25-27 (Birmingham University School of Education, 1964)

sa tante ? Drill is then provided by variously combining the four adjectives with the two women and then the *plus . . . que* response is extended to include other adjectives, *jeune*, *agée* and in combination with other subject nouns. Finally it is used in a short passage which forms the basis of active question and answer. Here are three main ingredients of response learning : first the construction of the response, then its drill and lastly its extension.

Good examples of such operant response learning, leading to solution of problems, are seen in the *Nuffield Foundation Scheme Experimental French Course* for primary schools and in the C.R.E.D.I.F.[1] French course for foreign children in France—*Bonjour Line.*

The young teacher will notice also that, whatever his subject, sooner or later the learner will insist that he is given the opportunity to construct and produce solutions.

(vii) *Learning as Change in Behaviour*

We judge that learning has taken place when we can observe changes in the person's behaviour. Sometimes this behaviour is made up of what the pupil puts in his exercise books or what he says in an oral lesson. In another way it is the skill he shows in games, crafts and hobbies, and another in his way of conducting himself in his social life, whether at home, in the streets or in the extra-curricular activities at school. Now these changes in behaviour result as a consequence of the child's perception of changes in his environment and also as a result of the changes in his responsive actions. When a boy learns to trap a football, he shows a change in behaviour (trapping the ball) which follows as a result of antecedent changes in his environment, such as lobbing passes that lend themselves to trapping, his perception of these changes and the accumulated actions of previous attempts at trapping the ball. Similarly, the girl who gradually becomes more accomplished on the piano exhibits these changes of behaviour (increased dexterity and timing of playing) as a result partly of changes of experience and skill within herself and partly as a result of attempting new pieces and receiving tips from her teacher.

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[1] Centre de Recherches et d'Études pour la Diffusion de Francais.

We may say, therefore, that learning reveals itself in changes of behaviour consequent upon antecedent changes in the learner and in his environment.

Learning is different from reflex action. The restlessness which accompanies hunger is reflexive but the enjoyment of a meal in a good restaurant contains in addition a learned element.

The changes in behaviour that interest teachers are also cumulative in their effects. The pupil learning, say, geography builds up a sequence of related changes. So does the learning that the teacher wishes to avoid, that is wrong learning, whether of processes in arithmetic or avoidance, truancy and maladjustment. The linear form of programmed learning builds up knowledge by long series of situations which call up responses which are cumulative in their effects.

The changing of the response in a learning situation is seen at its best in the learning of skills and foreign languages. There are certain conditions for making the changes. Thus the response can be ‘ shaped ’ by a process of feedback between teacher and taught. Learning how to pronounce the German word *Wo—where* is a good example. I once heard a middle-aged, middle-class English woman learning to pronounce this sound, awkward for a person of such a background, in this way : her first response, *wo*, as in middle class *know* (œ—oo) ; teacher : *wo* (pure undiphthonged ‘ o ’) ; woman : *wo*, as in Yorkshire *know* (aw—oo) teacher : *wo* (again pure undiphthonged ‘ o ’) ; woman : *wo*, nearly there. This is an instance of ‘ shaping ’ by echoing and repeating and shows the reciprocal role of the teacher and taught in the stimulus response situation, the responses of the learner being stimuli to the teacher and the responses of the teacher being stimuli to the learner.

Much can also be gained if the learner notices his own faults, as in acquiring a skill like table-tennis, where incorrect positioning of feet and wrist movements produces results at the other side of the table which give immediate feedback. Also, what has been said about the simple pronunciation of single words in a foreign language applies to the building up of the structure in the form of sentences and connected material.

Changing the response by ‘ shaping ’ is almost invariably used in the earlier sections of programmed learning texts.[1] The programmer starts from what existing on-going responses the learner has and develops these in relation to the new learning situations set out in the programme.

We have used two ideas : *control* of the response by the stimulus (section (iv) and *shaping* of the response by feedback (this section). They are not the same thing. Shifting the control of a response means changing the stimulus giving rise to it, as shown in the example from learning Russian on p. 18. Shaping a response means changing the response as a result of feedback from the teacher and subsequent practice, as in the above example on learning how to pronounce *Wo*.

(viii) *The Permanence of Simple Learning*

The explanation of the permanence of learning underlies every model of learning but is most appropriately tied to the idea that learning is a change of behaviour as a result of a change in the learning situation. Two questions must be answered. How lasting is such a change of behaviour ? What are the conditions that make for its permanence ? There are several factors, all of which we may have noticed in our own school and college days. As we have suggested in section (iii) the changes in the learning situation must be noticeable. Also as we suggested in section (vii) prompt feedback to the learner of the precise results of a new or changed response is likely to make for permanence as seen in acquiring new physical and language skills. Finally, if we practise and exercise a new skill our experience tells us that it is likely to become more permanent. Over-learning by more repetition than is just necessary for immediate perfection is necessary for lasting perfection. The poetry ' learned off by heart ', the chemical equations we learned at school that come back to us in our adult years are examples of over-learning.

On the other hand, if the exercises and drill are too narrowly conceived, then we shall tend to restrict width of application later. So a pupil over-drilled in a simple equation of the kind $4x-7=x+5$ may find $\frac{a-6}{4}-3=2\ (2-a)$ beyond him (see next chapter). For in classroom learning, drill and exercise are only part of the whole situation and they have their limited weight and time in the whole sequence. For example, some understanding should be established before drill and exercises are given. This condition is required since meaningfulness and belongingness of the different words and ideas are important elements in human learning (see also next chapter).

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[1] Leith, G. O. M., Peel, E. A., Curr, W., *A Handbook of Programmed Learning*, Chap. II, pp. 25-27 (Birmingham University School of Education, 1964)

Let us now study the results of experiments carried out by educationalists and psychologists on the learning of simple verbal tasks designed to investigate the conditions promoting the permanence of such learning.

The learning situations used may resemble those of ordinary school learning or they may be simplified considerably as in the learning of word lists and nonsense syllables. Whatever experimental material is used, the main aim of the research worker is to control the conditions of learning so that some factors may be held constant and others varied to be observed more accurately. If the experimental situation and material are very much simplified we may have to ask how far the findings are relevant to the classroom situation. Thus in the learning of a list of nonsense syllables it is found that distributed practice of the learning with a minute or two between each display of the list, leads to more efficient learning than massed practice where each display of the list follows immediately upon the next. If, however, the list is changed to include words and connected words or the task becomes a meaningful passage the superiority of distributed practice tends to disappear. Now the latter kind of learning predominates in ordinary classroom work so the results of experiments on lists of nonsense syllables will have to be considered with reservation in relation to the school situation. Let us take another case. In experiments on programmed learning it is usually found that beginners, younger children and less able pupils, do better when they write or say their response overtly. But this finding does not apply to older, maturer and more sophisticated learners.

(*a*) *Frequency and Practice*

Although the effects of extra practice on a verbal learning situation scarcely need experimental confirmation, we illustrate the results from incidental information gathered from an inquiry into the effects of direction and strength of association upon the permanence of verbal learning.[1]

The effect of a single short period of extra practice is easily compared with that of a rest period of the same duration. The learning task consisted of forty words and their translation into a new ‘ language ’. The list was learned by 48 adult students, randomly divided into four equal groups. They were allowed 10 minutes to learn the task and then tested. Groups I and II were asked to give the new ‘ language ’ rendering for a selection of 20 of the words on the original list. Groups III and IV had to give the English rendering of the same words presented in the new ‘ language ’. Thus Groups I and II had to ‘ translate ’ the vocabulary into the new language and Groups III and IV had to translate the same words into English . Following these first tests, Groups I and III were given a further period of 15 minutes learning of the original list of 40 items and Groups II and IV were allowed a period of 15 minutes' rest All four groups were then tested with the same material used in the first tests. They were then tested again, one week and three weeks later.

English	*New ‘ language ’*	*English*	*New ‘ language ’*
picture	kuplo	wave	ondi
wall	steyn	window	etro
chemist	aptek	room	nachen
table	benro	onion	luk
eagle	opel	sovereign	rulker
girl	medel	house	medor
violin	skreepon	rain	porwet
knowledge	vardin	servant	budeg
iron	gospiel	eye	inlash
lodging	quartviv	purchase	zakot
fire	skogon	ladder	leinson
head	kapta	bell	tobgong
courage	perilc	measure	vergal
field	lopa	dream	bonda
watch	svela	carpet	koverb
merchant	lugla	pencil	narak
wisdom	konsto	glass	stekler
biology	ankot	circle	rugit
couch	seden	hat	bonty
punctuality	kafun	ability	kannee

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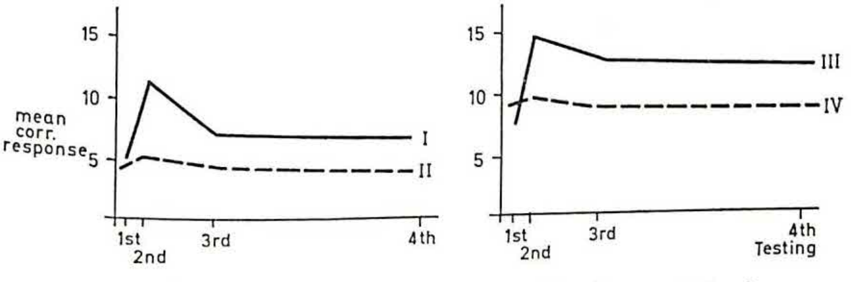
[1] Peel, E. A., Unpublished research (University of Birmingham School of Education)

The mean numbers of correct responses (maximum possible 20), obtained by each group of 12 in each testing are given below :

TABLE 1

	Groups		Groups		
	Re-learning	Rest	Re-learning	Rest	
	I	II	III	IV	
1st Testing .	5·1	4·5	7·4	8·4	
2nd Testing .	10·6	4·4	13·7	8·8	after 15 minutes re-learning for I and III and 15 minutes rest for II and IV
3rd Testing .	6·1	3·9	12·4	8·2	after 1 week's interval
4th Testing .	5·6	4·0	11·4	7·8	after a further 3 weeks' interval

These results are represented graphically below :



English stimulus
New language response

New language stimulus
English response

FIG. 1

These figures and graphs clearly demonstrate both the immediate and more permanent effects of the extra practice given to Groups I and III.

The important special case of extra practice is seen in the phenomenon of over learning already mentioned The importance of over-learning cannot be over-stressed in school work, particularly in the acquisition of languages The discussion of the merits of this or that learning in modern languages really should not be as to whether rote methods should or should not be used (of course they should be used—direct method is association put into practice between the spoken, written or seen vocabulary—and the picture, object, mimed gesture or dramatised action) All learning begins by being specific and it is therefore important that the learning is the kind we want and that it is brought to perfection by over-learning.

After thus introducing a simple learning situation we can turn briefly to finer points about such experiments designed to test practice and frequency.

In most experiments either of a psychological laboratory kind or of educational origin the effect of frequency *by itself* is rarely tested. Thus in paired associate or serial learning by the method of anticipation, the learner is first taken through the list of words or nonsense syllables he has to learn and then is asked to anticipate each one on succeeding presentations. After each anticipation he is shown the correct response and so is confirmed or corrected in his response.

Thus he may have to learn to respond with the word BUSH to the stimulus word HOUSE. He is told this by the first presentation and then on the next he is presented with the word HOUSE alone and a pause follows for him to give his response. Then the words HOUSE and BUSH are shown together which enables him to check his response and so improve the learning. The results of the learning are known at each stage and we are in effect measuring the consequence of frequency combined with knowledge of results or consequences of the learning (see Chapter V, Section (iv)). In Thorndike's experiments where no information was given about the accuracy of the response or otherwise, he could find little evidence of improvement. Similarly, in his word-number and sentence experiments he demonstrated that frequency without belongingness has little effect.[1] Belongingness meant that quality uniting the words of a sentence. Thus in the statement, *Mary has fair hair*, each word belongs to the rest by virtue of the sentence unit.

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[1] Thorndike, E. L., *Human Learning* (Cornell University, 1931)

On the other hand we know that if a strange name or number has to be committed to memory, quite apart from any association, repetition of it does result in learning. Underwood and Schulz[1] resolve the difficulty by suggesting that first practice *per se* will result in increasing the available repertoire of responses. In Thorndike's experiments the elements of belongingness, knowledge of results and after effect are all related to a second phase in the associative link (hook up) between an available response and a particular stimulus.

Perhaps the problem is not a really serious one, since in most learning situations, whether in a psychological laboratory or in a classroom, frequency and repetition operate with associative factors.

(*b*) *Spacing of Practice*[2]

In the case of simple rote learning the spacing of practice is also important. This topic has received much attention (see McGeogh and Irion (Chapter XI) and Osgood (pp. 504-509))[3] but the two independent series of researches by Hovland and his co-workers[4] and the later set by Underwood and his associates[5] bring out all the important features of spaced rote learning.

In learning experiments on the spacing of practice, in the main we use two measures of learning success : the immediate effectiveness of memorising and the degree of retention after learning has ceased. The criterion of success may be the number of correct responses after a fixed number of trials or it may be the number of trials leading up to a fixed degree of proficiency.

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[1] Underwood, B. J. and Schulz, R. W., *Meaningfulness and Verbal Learning* (J. B. Lippincott Co., 1960)

[2] This section on the spacing of practice refers mainly to nonsense syllable lists and apart from the last two paragraphs may be omitted on a first reading.

[3] McGeoch, J. A. and Irion, A. L., *The Psychology of Human Learning* (Longmans Green, New York, 1956)

Osgood, C. E., *Method and Theory in Experimental Psychology* (O.U.P., New York, 1953)

[4] Hovland, C. I. The series of researches are reported in the *Journal of Experimental Psychology* from 1938 to 1940 and continuing in 1949 under the general title of 'Experimental Studies in rote learning theory', beginning with : Hovland, C. I. 'Experimental Studies in Rote Learning Theory I : Reminiscence following learning by massed and distributed practice. *J. Exp. Psychol.*, **22**, 201, 1938.

[5] Underwood, B. J., The representativeness of rote learning, pp. 48-87 in *Categories of Human Learning*, Melton, A. W. (Ed.) (Academ. Press, New York, 1964)

The material used ranges from lists of nonsense syllables and words to sentences and whole passages such as required in school learning.

When we test the retention of material we are in addition interested in the length of the intervals between cessation of memorising and re-testing for retention and also in what happens in these rest intervals. In these inquiries we assume that no more deliberate learning has been going on in the intervals between the application of retention tests.

Here are two instances of such research. In his series of experimental studies in rote learning theory, Hovland investigated the effectiveness of serial and paired associate learning measured both by efficiency of memorisation and of retention under conditions of:

(i) massed versus distributed practice,
(ii) lengthening the time interval between the presentation of each item,
(iii) increasing the length of the list to be learned.

In one experiment[1] he obtained the number of trials required to reach learning levels of one correct recitation of up to twelve syllables. These data were obtained under four conditions:

(i) massed practice with a two second interval between each nonsense syllable,
(ii) massed practice with a four second interval between each nonsense syllable,
(iii) distributed practice with a two second interval between each nonsense syllable,
(iv) distributed practice with a four second interval between each nonsense syllable.

In massed practice only six seconds separated the repeated exposures of the series of twelve nonsense syllables. In distributed practice there was a two minutes six seconds interval between each presentation during which the subjects named colours presented on the memory drum. This ensured that the 'rest' period was not used for quiet rehearsal of the test series.

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[1] Hovland, C. I. 'Experimental Studies in Rote Learning Theory III: Distribution of practice with varying speeds of syllable presentation.' *J. Exp. Psychol.*, **23**, 172-190, 1938.

The following average number of trials was required to reach a criterion of one perfect recitation of the twelve nonsense syllables (*op cit.*, p. 174).

TABLE 2

	Average No. of trials
Massed Practice 2 sec. intervals .	14·89
Distributed Practice 2 sec. intervals .	11·18
Massed Practice 4 sec. intervals .	6·78
Distributed Practice 4 sec. intervals .	5·85

It is clear that the effectiveness of learning serial material is much improved by lengthening the interval between each item from two to four seconds. It is also evident that distributed practice is more efficient than massed practice, but also that the superiority of distributed practice is less marked when a longer time-interval separates the items of the series. These findings were later confirmed [1] by presenting paired associates at one-second and two-second intervals.

TABLE 3

	1 sec. rate		2 sec. rate	
	M.P.	D.P.	M.P.	D.P.
Mean number of trials to reach a criterion of two perfect recitations .	30·2	20·8	16·4	13·5

Hovland's series of experiments suggest that as far as memorising nonsense syllables is concerned, distributed practice is superior to massed practice but that this superiority is not so marked if the interval between the presentation of items is increased.

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[1] Hovland, C. I., VIII *J. Exp. Psychol.*, **39**, 714-718, 1949.

In 1951, Underwood and his co-workers published the results of the first of a long series of experimental studies of distributed practice[1] in which he also varied the amount of intra-list similarity between items, compared serial with paired associate learning, varied the meaningfulness of his material, used discrimination tests and material requiring the learning of concepts and varied the 'activity' of the learner during rest periods He measured learning effectiveness, and re-learning retention.

In the main, Underwood's series of experiments tended to confirm Hovland's findings with regard to the learning of nonsense material and of adjectives. Rarely, however, did he confirm either Hovland's experimental results with regard to recall and re-learning.

When we turn to the learning of meaningful material we find that the effects of distributed and massed practice are either the same or in the case of learning larger units of connected material, may even be reversed. Massed practice may be superior. For instance Garrett[2] set adult subjects three tasks of 'ideational learning': a symbol digit test in which the number of correct substitutions of digits by appropriate symbols was scored, a code learning test in which the number of letters correctly translated was scored, and an artificial language test in which the number of words correctly translated gave the score He found a slight, more often than not, statistically insignificant difference in favour of distributed practice in the case of the code learning and symbol digit tests. In the case of the artificial language test, massed practice was slightly more effective, significantly so in two out of four sets of experiments.

These researches show us how careful we must be in interpreting results from simple human verbal learning when we are concerned with the more complex learning required in the classroom.

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[1] Underwood, B. J. and Goad, D., Studies in distributed practice I: 'The influence of intra-list similarity in serial learning', *J. Exp. Psychol.*, **42**, 125-134, 1951.

[2] Garrett, H. E., 'Variability in learning under massed and distributed practice', *J. Exp. Psychol.*, **26**, 547-567, 1940.

(c) *Effect of Rest*

When material is moderately learned and the tests of retention given, the curve of forgetting is as follows :

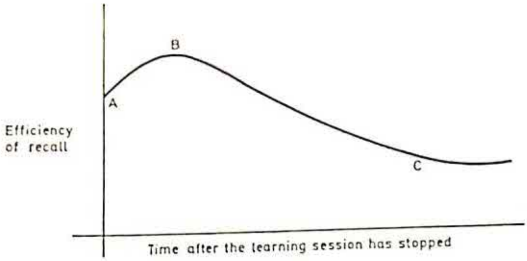

FIG. 2

The ascending portion (AB) of this curve shows reminiscence and the descending portion (BC) shows forgetting or inhibition. In rote learning the highest point B is reached in a matter of minutes.

In one of Hovland's investigations [1] he had people learn a list of 12 nonsense syllables by massed practice to the point where the learners gave one perfect recitation. Then they were tested for recall of the list after varying times had elapsed after the learning session had stopped. His results were as follows :

TABLE 4

Interval between learning and recall .	6 secs.	2 mins.	10 mins.	24 hrs.
Average number of syllables retained .	10·9	11·3	9·3	2·6

In the case of manual skills apparently performance can go on improving somewhat slightly longer. In the case of meaningful verbal material, such as the poetry used by Ballard,[2] the peak is reached after a day or two. Here is a graph which illustrates his main findings :

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[1] Hovland, C. I., ' Experimental Studies in rote learning theory VI ', *J. Exp. Psychol.*, **26**, 568-587, 1940.

[2] Ballard, P. B. ' Obliviscence and Reminiscence ', *Brit. J. Psychol., Monog.*, **1**, No. 2, 1940.

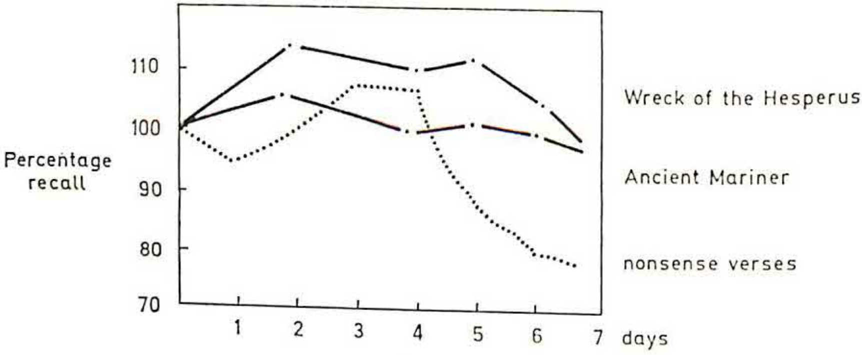

FIG. 3

Reminiscence may be accounted for in terms of the mental work theory by which it is assumed, on the physical analogy, that the carrying out of an activity produces by-products that tend to inhibit further activity. Muscular fatigue is a typical instance of the process at work in the physical being. When the learning activity ceases the organism begins to recover from the effects of fatigue and reactive inhibition and hence the recall improves.

It has also been suggested that reminiscence can be explained in terms of re-activated motivation. After a spell of intensive practice, motivation falls but in the period between the cessation of learning and the earlier recalls it is resuscitated.

Another explanation describes reminiscence in terms of differential forgetting. It depends upon the assumption that the wrong things learned in the given task are not so strongly learned as the right things. This seems a sensible assumption, for by right things we mean the learning that the learner has been asked to make. The wrong things are acquired incidentally in spite of these directions, but after a short period of rest following upon cessation of learning they are forgotten first and we record an improvement in learning. When we pass through the period of reminiscence the right things begin to disappear and as the time-interval lengthens between cessation of practice and recall the material forgotten continues to increase.

The theory of differential forgetting links up with the explanation of forgetting partly in terms of experimental extinction by which it is assumed that unrewarded responses are extinguished by the lack of reinforcement.

(*d*) *Extinguishing Responses*

After the immediate initial improvement (shown by reminiscence) in the post-learning period, forgetting sets in and eventually the responses may disappear or at least fall to the level of the retention of the material over-learned.

Forgetting is extinction of response. Sometimes we may wish to bring it about. Sometimes nature brings it about if the responses are wasteful or not conducive to survival. Such unlearning comes about quite simply by the learner just not continuing the response. If learned habits and processes are to be maintained, they must yield results. In the long run only those stimulus-response bonds which do yield results will survive. A human learner soon changes aggressive, rude behaviour if it produces no effects. Similarly, in classroom question and answer, the pupil's answers or attempts by hand-raising will be extinguished if the teacher does not react to them.

This principle has some shortcomings when we apply it to much human learning, for the relative value of the results of different stimuli is often a matter for the person to decide. Of course, common sense and science give us a body of causal stimulus-response connections, but a lot depends on the person himself. He may not be well informed, he may be superstitious or addicted to stereotyped behaviour, all leading to the maintenance of stimulus-response bonds which have little obvious survival value.

In the last section we observed that what has been deliberately learned will be better retained and recalled than what has been acquired incidentally.

As already suggested when we discussed the effects of rest, another part of the basis of forgetting may be neurological and physiological. Whenever a response is evoked in an organism there is left behind a condition or state which tends to halt the activity which caused that state. We call this tendency *reactive inhibition*.

We have, therefore, the two important aspects of forgetting, the *extinction* of useless and unadaptive S-R connections by the failure to reward them, and the *inhibition* which is produced as a trace following upon any activity.

Forgetting can be caused by the interference produced when new material is interposed between the end of a learning session and the occasion used to test what has been recalled. Thus if task A has been learned to a known level of efficiency and then task B is interposed and finally efficiency in task A is re-tested, the fall in performance is greater than if no task B had occurred.

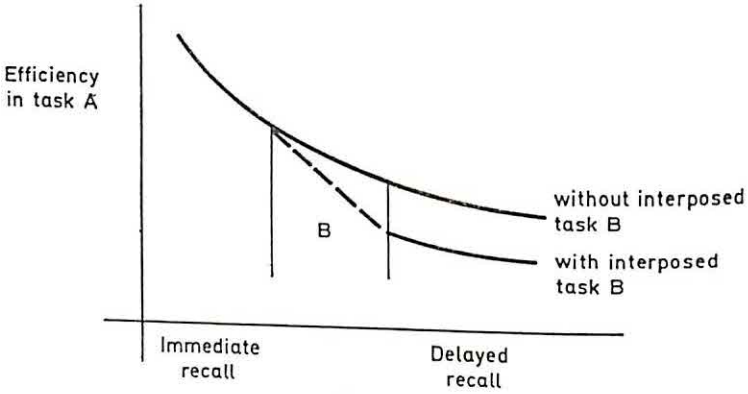

FIG. 4

Such interference has been demonstrated in many cases in simple learning of word and nonsense syllable lists,[1] and it is called retro-active inhibition. When the material A is more meaningful, as in the meaningful learning of arithmetic, the retro-active inhibition is not so marked (see the reference to E. Swenson in the next chapter, p. 51).

Retro-active inhibition means the interference introduced by a later task in the retention of an earlier one. One may also have pro-active inhibition in which the earlier task interferes with the learning of the later one.

Forgetting is thus seen to be a complex phenomenon in which fatigue, failure of response to yield results, disuse, lack of direction and interference all play their part.

[1] Underwood, B. J., ' Interference and Forgetting ', *Psychol. Rev.*, **64**, 1, 49-60, 1957

McGeoch, J. A. and Irion, A. L., *The Psychology of Human Learning* (Longmans Green, New York, 1956)

(ix) *Reinforcement*

The basic human learning discussed in this chapter consists of the formation of responses to stimulating situations. In sections (iv) and (v) we outlined response learning and drew attention to the fact that all responses are made under the control of some element of the learning situation. In section (vi) we took this idea further in relation to the formation of responses which enabled the learner to extricate himself from a problem situation. In section (vii) we considered the changing of responses by feedback between teacher and learner.

These phenomena can be brought together and an explanation offered for them in the theory of reinforcement.[1] What it has to explain is the connection between the stimulating situation, the desired response change in the learner and its consequences to him. A person learns to respond to a stimulating situation by the after-effects of his response. The contingency of three phenomena : *a noticeably stimulating situation, the response made to it*, and *the palpable consequences of this response* constitute a reinforcing state of affairs. Under such a state the response is said to be reinforced and after each such contingency it is more likely to occur again.

In the basic learning we are concerned with in this chapter, the emphasis is on the contingency of these three phenomena. Stimulus, response and palpable consequence must occur close together in time. A wide range of learning phenomena can be accounted for broadly by this theory of reinforcement.

Thus the person learning to pronounce the German word *Wo* makes his response in the following three-point contingency :

A noticeable stimulation	*Response*	*Palpable Consequence*
Teacher says ·	Pupil says ·	Feedback from Teacher to Pupil ·
Say *Wo*	*Wo*	*That's fine or That's nearly correct.*

If the teacher does not wish to reinforce the child's response assuming it was a poor pronunciation of *Wo*, he would simply make it clear not only that it was wrong but also what it should be (see p. 25) until he has ' shaped ' the response to the correct form.

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[1] Skinner, B. F., *Verbal Behavior* (Methuen, 1957)

The learning of simple skills also affords good instances of reinforcement. Let us take the case of changing gears in a car, and in particular the slow release of pressure by the left foot off the clutch pedal.

Stimulus	*Response on the clutch*	*Palpable Consequence*
The new gear has been engaged by pressing down on the clutch and manually changing the gear lever's position.	Slow release by the left foot.	A smooth change of engine power.

If the release of the clutch has been too sudden the palpable consequences of such a response are immediately evident in engine-stalling or a jerky change of speed of the car. Repeating the process leads to a 'shaping ' of the response until it becomes automatic.

Let us consider the three components of reinforcement separately in greater detail.

(*a*) *The Noticeable Stimulus*

When a person is learning he is usually aware of many stimuli but he responds only to part of the total stimulating situation. Thus in learning the beginnings of arithmetic he may respond at first primarily to the teacher's instructions and suggestions, but later the control should shift to the actual calculations when the pupil does not require so much teacher control. If, however, there are difficulties in the learning the pupil may become more teacher dependent. If there is persistent difficulty, the learner may respond to anything in the total situation which will enable him to avoid its tedium and unpleasantness.

As indicated earlier, foreign language learning consists of responding to a situation which is composed of pronouncing rules, orthographic appearances, linguistic structures and meaning. At different phases of learning, different parts of this complex stimulating situation control the response.

Part of the total noticeable stimulus situation lies in the states of need and feelings of the learner. If he is hungry, tired, eager to leave a situation, these stimulus elements may be the ones he will react to. But this is not all. His previously learned responses themselves act as stimuli for further responding. This is true of complex skills like games and all school learning which depends on language and connected discourse.

Learning has to be precise and reinforcement would seem to tend to produce a specific response to a particular stimulus. But a person rapidly learns to respond in a given way to a range of stimuli, by virtue of some common property he has noticed among them. The property may be sensory as in recognising all red objects, all piano notes, etc., and making a characteristic response. The properties may be functional, as seen in the stimulus objects : pram, car, bicycle, cart, tram, etc. Such extensions of the range of stimuli which evoke a given response produce the basis of concept formation (see Chapters III and X).

(*b*) *The Response*

The response too can range widely to any given stimulus situation. Thus to the spoken words :

develop	the responder may write *develop* or *develope*
precede	he may write *precede* or *preceed*
kirche	he may write *kirche* or *kirsche*

More positively because he has learned Latin he may respond more variedly and effectively in learning French or because he has studied botany and chemistry he may respond more powerfully in solving problems in horticulture or agriculture (see Chapter III on Transfer of Training).

We see then that the one-to-one correspondence of a given response to a specific stimulus disappears after the beginnings of learning and that most human learning requires a model that goes beyond simple three-term contingency units.

(*c*) *The Palpable Consequences*

The key element in the reinforcement situation is that covering the palpable consequences of the whole situation. It has already been suggested that one way of looking at this element is to describe it as feed-back of information to the learner by the teacher or other parts of the stimulus situation, as to the learner's progress.

Many things constitute palpable consequences. First there is what Thorndike called the law of effect. When a person is in a problem situation and takes action to solve it, the effects of his action are immediately brought home to him. Reward and punishment are also palpable consequences and in their broadest terms form the bases of the verification or correction of much school learning. In more elementary physical and physiological situations the palpable consequences may consist of the relief of physical needs such as hunger and thirst or the avoidance of physical deprivation such as fear and pain.

In the school situation, however, by far the most important form of the consequence to a learning response is the information given to the learner about his progress, whether he is correct or incorrect and, if the latter, in what way he is incorrect. Another source of correction comes from the learner himself. He is capable of commenting upon his own performance and of indicating to himself ways in which it should be improved. This self-editing, self-commenting power marks the highest levels of human activity.

In his account of reinforcement, Skinner does not elaborate on the different kinds of palpable consequences. He is merely concerned with obtaining a response. On the other hand, Hull [1] and Mowrer [2] describe more fully the role of need-satisfaction as one of the consequences of a learning situation. This third element of the reinforcement state of affairs really introduces the whole topic of the motivation of human learning and we shall deal with this more fully in Chapter V.

This brief account of the simple theory of reinforcement, together with some comment and elaboration on its three components, suggests that some elaboration must be made to the theory if it is to be made of use in accounting for school learning.

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[1] Hull, C. L., *Essentials of Behavior* (Yale Univ. Press)
Hull, C. L., *A Behavior System* (Yale Univ. Press)

[2] Mowrer, O. H. *Learning Theory and Personality Dynamics* (Ronald Press)

First, humans are capable of learning when they are not immediately reinforced or rewarded. They are capable of carrying out long operations, as in a mathematical proof or an essay, which yield results only at the end of a long sequence of events. Secondly, human learning is not always specific. Learning generalises as in concept formation and transfer of training. We shall see in the next chapter how the idea of reinforcement has to be extended to account for concept learning. In Chapter V we shall see how the theory has to be amplified to explain long term motivation.

(x) *Reading List*

McGeoch, J. A. and Irion, A. L. *The Psychology of Human Learning* (Longmans Green, New York, 1956).

Osgood, C. E. *Method and Theory in Experimental Psychology*, Chs. 12 and 13 (O.U.P., New York, 1953).

Gagné, R. M. *The Conditions of Learning* (Holt Rinehart Winston, 1965).

Underwood, B. J. 'The representativeness of rote learning' in

Melton, A. W. (Ed.). *Categories of Human Learning*, pp. 48-87 (Academic Press, New York, 1964).

Skinner, B. F. *Verbal Behavior* (Pt. II, Chs. 3-7) (Methuen, 1957).

Thorndike, E. L. *Human Learning* (Cornell University, 1931).

(xi) *Exercises*

1. Here are examples of intelligence test items which call for discrimination. Study them and comment on how far the discrimination is solely at a perceptual level.

[1] Below are some words and numbers. Alongside each are five similar words or numbers. Draw a line under the one of these five, all at the right, which is an exact copy of that on the left.

1. Helwan	Helman	Hemlan	Nelwan	Nelnan	Helwan
2. Albainn	Albiann	Albainn	Alrain	Ablainn	Arbaan
3. Vereeniging	Vereeniging	Vereniging	Nereeniging	Verineegig	Verineeging
4. Leo.Tml.DB.	Leo.Tml.DB	LeotmlDB	Teo.TmlDb	Teo.Tml.Db.	Leo.Tml.Db.
5. Urug'y 3½%	Urgvy 3½%	Urug'y 3½%	Urog'y 3½%	Urugy 2½%	Urogy 3½%
6. Trepca	Trebca	Trapce	Treepca	Trepca	Trebga

2. Obtain a copy of one of the lessons in either the Oliver & Boyd *Structural French Course*, the Nuffield Junior French Teaching series or the

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[1] Abstracted from a Test of Ability composed by C. M. Fleming and E. A. Peel.

C.R.E.D.I.F. *Bonjour Line* and examine the material in relation to the prevalence of response learning required in the lesson.

3. Here is a sequence from a linear learning programme. Notice how the designer of the programme is trying to ' shape ' the spelling responses of the learner.

Many people go to Blackpool to see the Blackpool I..........ns.

The Blackpool Illuminations are made up of lights of many different c......

Brightly coloured lights are often called ....

In the days before books were printed bibles were written out one at a time by h...

The monks who wrote these MANUSCRIPTS often used gold and brightly coloured inks for the first letter of a page.

Such handwritten books with coloured letters are therefore called i.......... m..........

CHAPTER III

LEARNING—CONSTRUCTION AND TRANSFER

(i) *The creation of ideas* (ii) *Assimilation and Accommodation* (iii) *Meaningful learning: construction* (iv) *Concept learning: responding in a constant way to several stimuli; responding under the control of a single stimulus property common to different stimuli; making explicit the properties defining a concept* (v) *What persists and spreads after learning?* (vi) *Learning sets* (vii) *The facilitation of complex learning* (viii) *Learning to think* (ix) *Reading List* (x) *Exercises*

(i) *The Creation and Use of Ideas*

In the previous chapter, on page 15, it was suggested that one convenient way of dividing up the topic of learning was first to deal with the acquisition of specific responses to given situations, and then to consider the richness and variety of responses in relation to the perceived situations giving rise to these responses. This prompts us to study such topics as *meaning*, *invention*, *discovery*, *application* and *extension of learning*. We are concerned with the creative aspects of learning. These turn very much on the human being's capacity to learn concepts and ideas and then to use them to solve further problems.

All learning, whether that of the simple responding outlined in the previous chapter, or that more complicated human learning to be discussed in this chapter, can be viewed either from the standpoint of the observable behaviour of the learner or from his own point of view, where the learning appears as experience. I have deliberately tried to avoid any drawing up of unnecessary distinctions between these two, but it is convenient in introducing higher human learning to refer at least to the importance of the role of experience to the learner.

The research carried out by workers on the intellectual development of children emphasises the importance of starting from the child's sense-experience and mobility and of building up experience through manipulation of objects and from the child's perception of the world about him. It is his growing capacity to co-ordinate what he sees, hears and touches with his capacity to move his body and limbs which lays the foundation of most of his ideas of the world about him. Piaget's long series of researches amply confirms this and some leading educators, including Pestalozzi and Froebel, made this approach an essential element in their methods of teaching. Perception and action are the precursors of understanding and of ideas.

One important thing, then, to the young learner is what is going on in himself. To him, learning is change of experience and even his actions, which appear to the teacher as behaviour, are to the pupil just more experience. When I give eleven-plus candidates an arithmetic project based on the postage rates printed in the ordinary book of stamps, the candidates have both to apply past learnings and experiences in arithmetic to deal with the project, and at the same time, in doing it, gain new experience. Similarly, every time a child is asked to read a passage in English and to comment upon it, new experiences are formed.

Any change of experience, whether casual, fragmentary or discrete, is learning, but it is more valuable learning if the changes are systematic, cumulative and if the experience produces ideas. In fact, school learning should be entirely of this kind whether it refers to the incidental social learning of school life that turns the new pupil who enters his secondary school at eleven into the mature, responsible school citizen at sixteen, or to the changes in experience implied when a pupil works through his first modern language course. The whole purpose of the direct method of teaching foreign languages is to produce systematic, co-ordinated and cumulative experience.

But the formation of experience and ideas is not all there is to learning. The human learner is a much more complex and forward-looking being. Having built up experience and formed ideas as a result of it, he spends much of his later learning in an active and creative way combining his new learnings constructively, checking statements made by his teachers, also those that he reads, applying his learning in new situations, and often re-formulating the ideas formed earlier. This creative activity starts very early. One must say now, very clearly, that learning does not consist of first building up storage tanks of experience and then turning them on as means for solving further problems. The order is right, but the application of ideas is inextricably interwoven with their formation when one considers a learner's broad progress through school.

The pupil who has learned the four rules in number rapidly uses these rules creatively to solve problems of spending money and carrying out operations about the home and environment. The learner of French is soon bored if the vocabulary is not made to work in real-life situations. The more sophisticated learner of geometry is able to re-formulate new problems so that they come within the compass of his previous learnings about the properties of geometrical figures. The pupil learning geography is able to invest the signs on an Ordnance Survey map with an almost material significance.

All this is creative learning and is the goal of every teacher. It is evident that once the learner has received a little equipment in a knowledge of, and experience of the conventions and language, he tends to be more independent of outside stimulation and looks for and goes out not only to meet his environment but also to make it.

What we have to account for, therefore, in the following pages, is the way in which concepts, ideas, are learned from past behaviour and experience and how these concepts and ideas are used by the pupil to further his learning.

(ii) *Assimilation and Accommodation*

The child's spontaneous play and reactions to his environment reveal two opposing tendencies which are significant in the building up of his experience.

Piaget [1] suggested that a child learns to react to the world about him by two processes that combine with each other in varying amounts as the child grows up. In some play the child *assimilates* his environment. He makes it do what he wants, as in make-belief play and fantasy. This mental assimilation is compared to the biological assimilation of organisms when they absorb food. Later the child learns that he has to *accommodate* himself to this environment. He cannot make it do just what he wants. Putting it another way, it turns out to be an inadequate symbol for what the child wants to do in his play and development. The child now has to come to terms with the complexity and power of a world in which he has to live. This combined process of accommodation and assimilation is often called adaptation.

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[1] Piaget, J., *Play dreams and imitation in childhood*, Ch. VI (Heinemann, 1951)

Of all school subjects, art,[1] most clearly reveals thta learning consists of a balance of these two processes of assimilation and accommodation. In the delightful paintings done by pupils during the primary years, qualities of imagination are revealed that are evidence of assimilation. Contrariwise, when the pupil is over-fearful that his painting does not look like the ‘ real thing ’ then accommodation is dominating his work. This often happens in adolescence when the ‘ artistic ’ quality, the essential imaginative element of art that every writer on art and every artist has insisted upon from Coleridge, and Tolstoy to Eric Newton, tends to be least evident. Later, art consists of a varying balance between the two tendencies. Some critics of modern expressionist art might insist that its creators have gone too far in the direction of assimilation.

Other school subjects show a similar balance between these two qualities, as for instance in the development of the pupil's powers of written expression and in his growing ability to appreciate poetry. The sensitive teacher of poetry makes capital out of both processes when he teaches his pupils how to feel and experience something of what the poet is trying to communicate.

What about the more mundane arithmetic? Too many young teachers set about this subject as if it is entirely a matter of accommodation. Of course, one cannot take liberties with number. In primary school arithmetic 4 means 4 and in the decimal system 3×7 is always 21. But the very fact that 4 means 4 of anything is assimilation. In fact, through its symbolising efficiency arithmetic provides the young learner with a powerful tool for assimilating his experience and he may adventure into the world about him of shops, towns, materials, post office, domestic affairs, geography, measurement and time, reducing them all to something he can manipulate.

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[1] Peel, E. A., ‘ Psychology and the teaching of art ’, *B. J. Ed. Psych.*, XXIV, 143-153, November 1954.

Tolstoy, L., *What is Art?* Trans. A. Maude (Oxford University Press, 1930)

Obviously the same can be said of elementary science which, through the organising power of its concepts, enables the pupil to master the world of nature. The inventions of industry and technology show how this mastery can be extended to *create* new phenomena and mechanisms.

This dynamic rhythm in which the child alternately *assimilates*, absorbs, transforms his environment and then *accommodates* himself to it, acquiring and learning, would seem to have a counterpart in the classroom situation. A good lesson must consist of a rhythm of construction by the pupil and instruction by the teacher. The first is essentially assimilation but it will defeat itself unless it is supported by the second in which the teacher's instruction leads the pupil to an accommodation to knowledge and environment.

(iii) *Meaningful Learning : Construction*

There is one experience in learning that everyone can testify to. School learning is felt to be successful to the learner only when it becomes *meaningful* to him. We have all tried, over brief intervals in our learning, to learn a new process with the most unsatisfying feeling of not really knowing what it is about. It occurs often in learning arithmetic, grammar and foreign languages.

In an experiment [1] in which learners were set two tasks : learning the Russian alphabet and learning a new number system to the base 5, it was found that the relative meaninglessness of the first task (the learners did not know it was an actual alphabet) played a significant part in their attitude to the task. The experimenter asked the learners to learn out aloud and to mention any feelings about the task. Many more instances of rote learning occurred in the case of the group learning the alphabet and there were more recordings of frustration at the meaninglessness of the task. In the case of the learning of the number system the learners quickly grasped that it was based on a significant system, even if at first they were not able to find out what it was. There were also fewer instances of recorded frustration in the learning task.

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[1] Peel, E. A. Unpublished research on the methods of learning used in learning relatively meaningless and meaningful tasks. University of Birmingham School of Education.

If we are determined learners, eventually we break through the relatively meaningless phases and something suddenly clicks and the learning becomes significant. Our task as teachers is to reduce the frequency and duration of these spells of meaningless activity. For this reason a teacher of arithmetic should always tend to justify the process he is teaching in terms of the familiar experience of the pupil. The working out of $\frac{2}{5}+\frac{1}{4}+\frac{5}{6}=\frac{24+15+50}{60}=\frac{89}{60}=1\frac{29}{60}$ seems far removed from the simple exercises the pupil may have learned in combining, say, portions of cake pictorially such as in the following : Yesterday we ate a quarter of the cake and today a third. How much is left for tomorrow ? But the addition of fractions is the combining of portions and can be introduced through it.

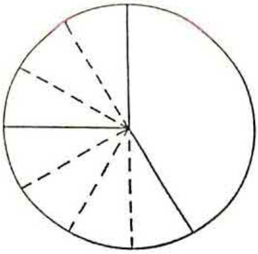

FIG. 5

In a study of the learning of the first 100 addition facts Swenson[1] compared (*i*) a meaningful method with (*ii*) a drill method and (*iii*) a drill plus method that made use of the single arithmetical meaning of equal ' Size of Sum ' that is, for example, of the fact that 2+7, 8+1, 7+2 are all '9' sizes. In her meaningful method the pupils related the different number facts by active direct 'figuring out' and composition in terms of the number system, that is, by counting in terms of a 10-base Drill in the facts followed this discussion of the 10-base number system The drill method presented each fact as a discrete bond or association to be learned and the order of presentation was based on 'difficulty studies'. When measured against a criterion including immunity from retroactive inhibition and transfer of the learning to untaught material, the meaningful method was found to be superior to the other two.

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[1] Swenson, E. J. Organisation and Generalisation as factors in learning transfer and retroactive inhibition. *Learning Studies in School Situations*, Studies in Education, No. 2, 9-39 (Univ. Minnesota Press, 1949).

The research carried out by Anderson [1] on pupils' thinking in arithmetic provides us with yet another instance of an educationist's view about 'meaningful' learning. As a meaningful subject, arithmetic is 'a closely knit system of ideas, principles and processes' which has 'an organised logical structure which can be understood by the pupil'. Learning in arithmetic consists of 'understanding number relations and the mathematical significance of quantitative situations'. On the other hand, when viewed as a drill, arithmetic is made up of discrete elements of skill not necessarily understood by the pupil as belonging to a logical system of number. Drill, however, is recognised as valuable 'for increasing proficiency in arithmetical situations after understanding has been developed or generalisations have been made' (Anderson, p. 41).

These two researches suggest certain essentials about the nature of meaning. First school learning is not mere association by reinforcement and drill. Each writer is agreed that drill, exercise, or repetition, are not as efficient instruments of progress in learning as meaning. They may enhance meaningful learning but first the 'meanings' have to be established. Meaning entails the additional principle of generalisation (see section (iv) later in this chapter) which occurs when the new learning is referred to existing experiences already established in the learner's awareness. The new may be said to appear as an instance of the generalised part of the child's experience.

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[1] Anderson, G. L. Quantitative thinking as developed under connectionist and field theories of learning. *Learning in school situations*, Studies in Education, No. 2, 40-73 (Univ. Minnesota Press, 1949).

We may emphasise four things about meaning. First that the complex learning carried out in school is felt to be successful to the learner only when it has achieved meaning for him. Although at first all learning is specific, later he abhors meaningless experience.

Secondly, meaning begins with the relating of the new learning to the old, which may become slightly changed in the process. To some extent the new is the extension of the old. Later, of course, the framework changes and expands.

Thirdly, that to some extent meaning is *constructed by* the learner with the help of the teacher.

Lastly, the teacher must be judicious in his distribution of explanation and drilling of new material.

The third quality mentioned above, that learning is in part meaning constructed by the learner, connects with our earlier insistence that the learner actively assimilates his environment.

As Piaget has demonstrated, many of our basic concepts, such as the permanence of the object, the reality of space, the nature of time, are not given to the young child ready made, but are constructed by him from his experience. His principal general thesis of most importance to education is that the young learner constructs his concepts and that experience plays the major role in this process of construction.

I want to carry this idea further and to suggest that school room learning consists essentially in the construction of meaning. The pupil *gives* meaning to unfamiliar material in terms of the tools and equipment making up the matrix of his experience. This matrix is not static but changes as the pupil changes. He often *appears* to be *finding* a meaning that exists because it is so worded and emphasised in teaching. Because we tend to generalise all the personal individual experiences into something that transcends the individual, *meaning* assumes an independent existence which has to be found. Often it is giving this independent existence when it appears in a textbook. The process within the learner is, however, that of constructing. This is revealed nowhere better than in the mistakes made when the pupil has difficulty in referring a new learning to established knowledge. He has then to do something about it and how odd some of these constructions are.

The reader himself may bear witness to the constructive nature of complex learning from his subjective feeling of satisfaction at achieving meaning. The importance of such satisfaction is also supported by instances of the impatience of the young learner at over-instruction. When he has a meaning for what he is doing he wants to be free to adventure and construct. Here, for example, is a girl in the middle forms of a grammar school beginning to learn chemical formulae, molecular weights and the fundamentals of valency. She has a series of formulae $CaCO_3$; $Ca(OH)_2$; $ZnCl_2$, and the atomic weights of the required elements, and has to give the molecular weights. Models have been used to demonstrate what is meant by H_2O and HCl. The learning has not quite generalised into such complexities as NH_4Cl or $Zn(NO_3)_2$. We have a brief discussion about the fuller meaning in these formulae of the numerical subscripts and the brackets. I give one example, but my attempts to give others are repulsed. The girl wants to construct this learning herself, to construct the operation from the new materials in the examples not yet attempted.

The same thing is shown in modern language teaching when, say, the rules of German case endings are constructed by direct methods of learning. This is the way in which the grammar of a foreign language should be first learned—by *constructing* it, not learning it as a ready made system to be applied in language work.

(iv) *Concept Learning*

The meaningful constructive learning just discussed has its roots in the concepts learned by the pupil. In the case of Swenson's research it was the decimal concept and in the problem of the chemical formula the concepts required were those of the atom, atomic weight, molecule and structure. We now ask how concepts are learned. We begin by going back to the previous chapter (p. 41), where we pointed out that in most human learning it is not simply a matter of learning one specific response to one given stimulus. As Skinner puts it [1]

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[1] Skinner, B. F., *Verbal Behavior* (Methuen, 1957)

'a verbal repertoire is not like a passenger list on a ship or plane, in which one name corresponds to one person with no one omitted or named twice '. The control of the response by the stimulus is by no means so precise. Several different stimuli may evoke the same response. We need now to list the bases of such common responding in order to understand how a concept is learned.

(*a*) *Responding in a constant way to several stimuli bearing some resemblance to each other*

The young pupil soon learns to call a wide list of objects by the name *knife*, ranging from a pen-knife, cheese-knife, table-knife, butcher's knife, the knife in a bacon slicer, to a guillotine knife. When he is very young he might wish to call a sword, a razor or a saw a knife but he is reinforced by his community, parents, friends, teachers, not to make a ' knife ' speaking response to such objects. Such a range of stimuli producing a common response by virtue of a common property —a particular kind of cutting—recognised by society is called a *generic extension* of the knife stimulus and constitutes the basis of concept formation.

But it is neither the only kind of stimulus-extension possible nor is it arrived at quickly by very young children. There are other common grounds of similarity between different objects and stimuli which are less common to all people. This is evident from numerous studies on young children.[1]

When children are presented with a collection of different shapes, each in several colours, and they are asked to put together those that are alike or the same, noticeable changes in how they interpret these instructions can be studied. Between the ages of three up to seven, three clearly distinguished ways of grouping together objects can be observed. First, up to the age of five and a half, very roughly, the children, form heaps which are half figures, half collections. Thus they will put together red triangles in the shape of a roof or they will put together other shapes just because they are pretty—they make a pretty shape—that is to the child. There appears to be no logical basis of these ' heaps ' as they have been called, or ' half-objects '.

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[1] Piaget, J. and Inhelder, B., *The Early Growth of Logic in the Child* (Transl. E. A. Lunzer) (Routledge & Kegan Paul, London, 1964)

Vygotsky, L., *Thought and Language* (M.I.T., Boston, 1962)

Annett, M. ' The classification of instances of four common class concepts by children and adults, *B. J. Ed. Psych.*, pp. 223-236, **29**, Pt. III, 1959.

In the next stage, from five and a half to six and a half, very roughly, the graphic, pictorial and descriptive quality seems to be smaller and less frequent. The child now begins to group in terms of shape, colour and size, but does not appear to use the criteria consistently. Thus he may start by picking all the triangles and eventually coming to a red one he switches the basis of his judgment to the reds of all shapes. He then might come across a small triangle and change to a basis of ' smallness ' of all shapes and colours. Inevitably, such a method of grouping always leaves a residue of heterogeneous, unclassified shapes.

The last stage consists of classification as an adult would understand it, namely cross-classification by shape and by colour.

Vygotsky tackled essentially the same problem by putting before the child a group of different shaped and coloured and sized wooden blocks, each of which had a name under it. One block was turned up to show the name and the child was then asked to turn up another which would also have the same name. Most school children and adults assume at first that if, say, a yellow is turned up, blocks with the same name will also be yellow. In fact they find that this is not so. In studying young children by this test, Vygotsky recognised three important features which tally very closely to those just mentioned from the work of Piaget. First there were ' heaps ' of objects, the criteria used to group them being very personal, egocentric and difficult to understand by the adult. Then there were collections where the child would group together all the yellows, say, in spite of the fact that the names on the backs were all different. A collection in adult usage would be the group of all the Smiths in the world. There is no logical basis of grouping together all the Smiths, merely the fact that they have a common name.

The last level recognised by Vygotsky corresponds with the ordinary classification which adults carry out.

Annett used quite different material. She had sixteen pictures of common objects in four groups of four: four animals, four vehicles, four plants and four articles of furniture. She scattered these at random in front of each child and then asked him to put together those which belonged together. Very young children showed little sign of any systematic grouping—they might be highly personal collections and often such children were not able to say what the basis of the grouping was. In the intermediate stages, things would be put together because they were connected through a common element, such as fish and ship would be put together because they were both connected with the sea, or birds and trees because birds build their nests in trees. Then lastly there was classification as the adult would understand it—on a logical basis.

These researches all showed that we could not expect a spontaneous, matured classification as adults understand it before ages of seven and eight. They also indicate that the child takes years to acquire the criteria by which objects are grouped and that in such instruments as intelligence tests, where many items depend heavily upon the logic of classes and grouping and ordering within the class, great care should be taken in the instructions to use language which makes it clear what is intended by the tester.

After the early specific responding to given stimuli the child appears to extend the range of stimuli very readily.

In a game of logic[1] played with young children with coloured beads and counters, the rule was:

> Whenever I (the experimenter) pick a red bead, you (the child) must pick a red counter.

There were yellow, red, blue and green beads and counters.

Now although nothing was said about colours other than red, very young children in these cases tended very strongly to pick a counter of the same colour as that chosen from the beads. Thus a yellow bead evoked a yellow counter, etc.

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[1] Peel, E. A. and Davies, F. A., Unpublished research on young children's logical thinking. University of Birmingham School of Education, 1966.

TABLE 5

Proportion of matching between the non-reds
(blue, green, yellow)

Age group mean (months)	No. of games	Matching draws	Non-matching draws
64	60	·91	·09
77	83	·59	·41
112	56	·42	·58
138	120	·38	·62
Proportions expected by chance (no extension of the red-red rule)		·33	·67

Older children tended not to extend the red-red rule in this way to other colours. At 138 months ($11\frac{1}{2}$ years), they chose non-red counters in such a way as to indicate that they were not influenced at all by it when selecting non-reds.

Older children and adults may see also other grounds for similarity than those of a generic kind. There are the metaphor and formal analogy[1] where the similarities may be more private. When we hear said 'She is the apple of my eye', we have a double metaphor :

apple of my eye = (German *augapfel*) = eyeball
then :
she is my eyeball = the most precious thing I have.

When the cartoonist likens present-day politicians and political incidents to those of history he is very often drawing a merely formal analogy which has no real explanatory significance.

We have also solecism and error. Here are two instances of erroneous extensions of a mathematical stimulus situation[2] evinced by a group of 14-year-old grammar school pupils :

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[1] Peel, E. A., Some Problems in the Psychology of History Teaching. p. 177 in Burston, W. H. and Thompson, D. (Eds.), *Studies in the Nature and Teaching of History* (Routledge & Kegan Paul, 1967).

[2] Saad, L. G. (in collab. with W. O. Storer). Understanding in Mathematics, *Educational Monographs* No. III, 1960 (University of Birmingham School of Education, 1963).

What is the value of the number with x as its units digit and y as its tens unit ?

$(10y+x)$ or $(x+10y)$	(correct)	5%	of the answers
$(y+x)$ or $(x+y)$		10%	
yx		13%	

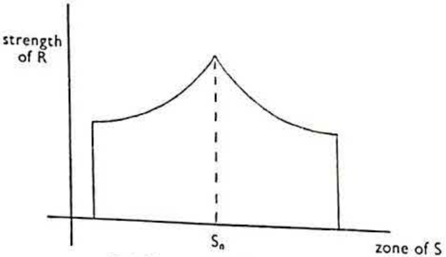
Here the erroneous answers give evidence of a wrong extension of the idea of the place system.

What is the next even number above the even number x ?

$x+2$	(correct)	31%
x^2		17%
$2x$		22%

Here there is confusion between the 2 as a number, a coefficient and a power.

In learning theory and its experiments the phenomenon of extension is called stimulus generalisation. Thus we might train a person to react to a buzzer. Supposing now we vary its loudness slightly. Work has shown that in the case of loudness, a *zone* of stimuli S centred on the particular intensity used in the reinforcing experiments is capable of bringing about the response R. Sounds on the edge of the zone, too soft or too loud, are less effective than those near the centre. There is a diminution as in the graph below.



S_0 *is the most effective stimulus*

FIG. 6

This is called primary stimulus generalisation.

Testers make use of stimulus generalisation when they test word recognition by the multiple-choice method, as in the following example from Schonell :[1]

thred thraed threab threed thread threard

The teacher's task is to make the correct response stand out clear from the remainder of the near correct words in the generalised zone. In a good test the correct response should not stand out too much in isolation.

In order to explain how we may get stimulus generalisation between different modes of stimulus Hull assumed that there is a *secondary stimulus generalisation.* This is a learned process and is seen when a dog, trained to salivate to a light, may be taught to salivate to a sound. Secondary stimulus generalisation is utilised in multiple-choice tests of intelligence. The principles of primary and secondary stimulus generalisation also account for much of the complex nature of human learning.

The relative power of directing future learning by primary or secondary stimulus generalisation has been investigated with mixed results, as in the effect of asking a person to learn the word *earn* and another to learn the word *vase* upon the subsequent learning of the word *urn*, or the effect of learning *cent* and *despatched* upon learning the word *sent.* Sometimes rhyming prompts (primary generalisations) and sometimes meaningful prompts (secondary generalisation) proved to be the more effective in aiding the learning of the final words, *urn* and *sent.* I carried such research a little further [2] and found that in general younger and less sophisticated learners tended to be aided more by rhyming prompts whereas older learners tended to be aided by meaningful prompts.

(*b*) *Responding under the control of a single property or set of properties common to different stimuli*

We are here concerned with the property or properties which bind several objects or ideas into a class. Thus a child reacts to several different shaped, sized and coloured objects as

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[1] Schonell, F. J., *Backwardness in the Basic Subjects*, 4th edition, pp. 542-543—Visual Word Discrimination Test (Oliver & Boyd, 1948)

[2] Peel, E. A., 'Learning and Meaning', *Bulletin, Brit. Psychol. Soc.*, No. 48, July 1962

sweets or he reacts to such words as ridge, escarpment, estuary, alluvial plain, water-shed, rain shadow, as all being part of geographical knowledge. The child may come across a bottle of aspirins and react to these as sweets—but the mother halts this extension vigorously. The correct limitation of the class of sweets is basically a practical affair. It is sometimes so practical as to be a matter of life or death. The instance from geography is also a practical affair since the pupil needs to know what is geography and what is not.

The process of learning to respond under control of the rule defining a class partly depends on the power to discriminate between stimuli (see Chapter II, Section (iii)) but more so upon the reinforcement provided in the learning situation—that is by the experimenter, parents, teachers, fellow-pupils and others.

Several psychological researches have been carried out to show how quickly people learn simple concepts and by what route they do so. One of the best known is that conducted by Bruner, Goodnow and Austin.[1] The technique is to put before the child an array of cards bearing different coloured shapes, etc., and for the experimenter to pick one card, telling the child that this is an instance of the concept he is thinking of. The child is then asked to pick another card which embodies the same concept and he is told whether he is right or wrong and the game proceeds until he has obtained the concept. Vygotsky's experiment, mentioned earlier, is also a game in which concepts have to be learned, this time by giving them a name.

(*c*) *Making explicit the properties defining a concept*

Very often when a person has to learn a concept from instances of it presented on cards, such as: stippled triangles cut by a single line, as exemplified in Fig. 7, the learner can recognise instances of the concept before he can formulate the concept in words. This tendency can easily be verified by using the Vygotsky blocks or sets of cards.

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[1] Bruner, J. S., Goodnow, J. J. and Austin, G. A., *A Study of Thinking*, Ch. IV, particularly pp. 83-90 (Wiley, New York, 1956)
Peel, E. A., *The Pupil's Thinking*, pp. 80 and 132-138 (Oldbourne Press, 1960)

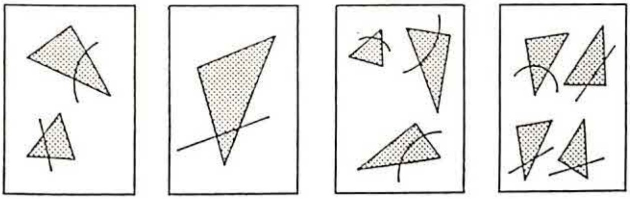

FIG. 7

Similarly, Saad[1] found that many 14-year-old grammar-school pupils, who could easily draw a circle with a compass and pencil, could not give an adequate definition. A quarter of his population gave such definitions as: a round figure, curved figure, a line round a point, a uniformly curved line, a line with no ends, locus of a point.

It is important to carry the learning to the point when the rule or law of classification can be explicitly stated. Up to this point an animal could learn to select instances in a classification. The essentially human feature is the ability to formulate the basis of the grouping. Most school subjects, and particularly mathematics, science and history, require for their understanding a firm statement of the qualities or rules making up their conceptual material.

A concept, then, is based on a classification, but it goes further in that the rule of action for making the classification can be stated and communicated to others.

There are three parts to a concept and all play an important role in education.

(*i*) The extension of objects or attributes (the instances) which may be classified, e.g.:

- (*a*) The class of buses, taxis, trains, ferries.
- (*b*) The many instances of freely falling bodies, or of bodies freely rolling down inclined planes.
- (*c*) A finished pile of Vygotsky blocks.

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[1] Saad, L. G. (In collab. with W. O. Storer). Understanding in Mathematics, *Educational Monographs* No. III, 1960 (University of Birmingham School of Education, 1963).

(*ii*) The rules which lead one to group these three sets of objects and phenomena
  (*a*) Moving contrivances carrying material and people from place to place.
  (*b*) The property that objects have of moving freely down towards the earth's surface.
  (*c*) The pile shall consist of large, flat blocks.

(*iii*) The name given to the concept (sometimes arbitrarily)
  (*a*) Transport.
  (*b*) Movement under gravity.
  (*c*) BIK.

In school work very often the pupil learns to use the name (*iii*) and is not sufficiently reminded during his later progress of what it symbolises, that is (*ii*) the rule which arises from the set of phenomena (*i*). For instance, in history, the use of new terms like *mercantilism* or *indulgence* in context only, without a clear statement of their meaning, can lead to much misunderstanding.[1]

(v) *What persists and spreads after learning?*

When a pupil or student has spent some time studying and learning a subject, what is the result? If we tested him immediately upon the completion of the learning session he would probably recall much of what he had actually learned. If we re-tested him months later it would probably be found that he had forgotten much of it. But this is not all there is to learning. In a more general way we may claim that he has achieved understanding and wisdom in the subject. We may test him by material which is not exactly that which he learned but is nearly connected with it. We should expect the experienced learner to do better than one who had had no learning in the subject. These general effects of learning may extend over years—in fact over the rest of the person's thinking life. Cronbach[2] calls this phenomenon a transfer of gains and includes in the idea the greater ease that a re-learner would find in learning again material that he had long forgotten, as compared with the difficulties a wholly new learner would have. What persists is not necessarily all the exact material learned but an augmenting tendency, which we may call understanding or way of learning, which promotes easier re-learning of the old material or the learning of new material somewhat connected with the old.

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[1] Peel, E. A. Some problems in the psychology of history teaching. Ch. I in: Burston, W. H., *Studies in the Nature and Teaching of History* (Routledge and Kegan Paul, 1967).

[2] Cronbach, L. J., *Modern Viewpoints in the Curriculum*, Edit. P. C. Rosenbloom, pp. 25-29 (McGraw Hill, New York, 1964)

Part of what carries over to new learning and thinking situations is the method of learning required in particular subjects. We have to make use of this assumption more and more as the body of learning expands. Thus pupils cannot be taught all the periods of history—a selection has to be made—but it is hoped that the learner acquires a historical attitude and aptitude (an idea initiated and exploited by Cronbach—see p. 64) which would enable him to deal later with unfamiliar history in an understanding way. Similarly, students of medicine and science cannot learn all that has been developed in these fields. Certain parts are selected and the emphasis is laid on structure, function, interrelatedness and on the method of action and thinking involved.

Here is a personal instance. I had to solve the following problem in electricity some thirty-five years after I studied current electricity (which was certainly not in terms of electric kettles).

> A 240-volt electric kettle which has a heating element of resistance 80 ohms. takes 14 minutes to heat $1\frac{1}{2}$ litres from 20°C to B.P. What fraction of the heat generated is used to heat the water?

My first reaction to the problem was that the kettle took a long time to bring the water to the boil! Next, although I had forgotten all about *joules*, I realised immediately that this was a problem of work input and heat output. The problem was to convert the electrical work input into calories and then to compare these with the calories required to bring the water to the boil. From a textbook I found the relevant equation for the work done by a known current flowing through a wire of known resistance and producing a known voltage difference between the ends of the wire. This work in joules could then be converted to calories (there are 4·2 joules in a calorie). We had then,

Heat required to raise the water to B.P.

$$=1500\times 80 \text{ calories (calories=weight}\times\text{rise in temperature)}$$

Heat produced by the current

$$=\frac{240\times 240\times 14\times 60}{80\times 4{\cdot}2}\text{ calories}$$

and the fraction of heat used, therefore,

$$=1500\times 80\Big/\frac{240\times 240\times 14\times 60}{80\times 4{\cdot}2}=\frac{5}{6}$$

When we teach arithmetic, English, geography, art, or any of the other subjects in the school curriculum, we assume we are doing more than making our pupils more or less narrowly proficient in these subjects. We are educating our pupils for something beyond school, to be responsible grown-ups. We assume that somehow the specific classroom learning will spread and persist so that it will be of use outside school and after schooling has finished. The assumption lies at the root of all formal education conducted in the special environment of the school (which is not even a microcosm of the outside world). Furthermore, we assume that learning one subject may give rise not only to material gains but also benefits from methods, attitudes and interests that will help in the learning of other not dissimilar subjects.

Cronbach distinguishes between two kinds of transfer of learning. There is transfer in substance, where the actual material learned in the first learning can be used in the second. In essence,

> 'this is to equip the person with a generalised skill or concept so that he can analyse a new situation or can carry forward an effective habit.'[1]

Thus learning how to produce top spin in table tennis can carry forward to tennis and cricket and to learn grammatical concepts in one language or in a particular situation can benefit learning in other languages or in new situations. Here we are concerned with the transfer of content. But as indicated earlier (p. 63) we have reached a phase in the curricula of many subjects, science, medicine, history, where some content has to be sacrificed and where a compensating concentration on the method of thinking, inquiry and research in these fields is developed. Our aim is to go beyond transfer of substance to transfer of learning and thinking method. Cronbach prefers to call this latter, transfer of aptitude. The old and the new learning situation may have only little *substance* in common, as in the case when a person who has studied mediaeval British history is expected to be more competent to deal with 19th century European history What are common are the principles of historical thinking.

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[1] Cronbach, L. J., Unpublished paper, 'Aptitudes as an outcome of instruction', (C.A.S.B.S., Stanford, 1960)

Training in one field is most effectively transferred to another if the transfer is both in terms of substance and of mode of thinking and organisation.

(vi) *Learning Sets*

It has long been known [1] that exercise in simple similar but not identical tasks requiring discrimination between patterns and shapes can bring about a greater facility in carrying out new but related tasks. Such a facility to extend the learning is called a learning set. It has also been called learning to learn. The learner acquires not just so many discrete skills but a generalised readiness to learn similar and even more difficult material.

The idea of a learning set has been further extended and demonstrated experimentally by Gagné and his co-workers [2] to account for the sequence of learning and understanding required in solving simple algebraic problems. By starting from the last operation required to solve an equation they worked back to the starting point and then showed that each stage in the normal forward solution, recognition of symbols, pairing of like terms, transposing or making an identity, facilitates the next until the final solution is achieved. He found a hierarchy of learning sets (pairing like terms or transposing, etc.) leading up to the apex of final solution of the equations. He showed also that a lower supporting set had to be mastered before the next higher one could be achieved.

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[1] Harlow, H. F. The Formation of Learning Sets, *Psychol. Review*, **56**, pp. 51-65, 1949.

[2] Gagné, R. M. and Paradise, N. E. Abilities and learning sets in knowledge acquisition. *Psychol. Monog.*, **75.4**, Whole No. 518, 1961.

What is really happening is that the learner is forming concepts about the material he is learning and about his own actions which he has to carry out in order to reach a successful solution. These concepts are essentials for the later spread and re-application of learning. But it is also a help if the learner is active and purposeful in looking for the parallels with other material and must make conscious deliberate efforts to effect the spread of learning. For this reason it is always a mark of good teaching when the teacher draws the attention of his pupils to the parallels, similarities, applications and generalisations that may be possible from the material and methods being studied. Every lesson should contain some elements of a comparative method.

This is a phenomenon of ' spread ' and an essential ingredient appears to be the formation of concepts about *what* is learned and *how* it is learned.

The conditions for promoting transfer and learning sets have been investigated. A question sometimes posed is how far the learning should be broad or deep. Thus Leith and Clarke[1] wished to prepare pupils to add and subtract in the 6-base number system by building up a learning set on the basis of other non-10 bases. They had three groups of learners and four programmes of 99 frames on addition and subtraction in each of the 4 systems in 5, 7, 8 and 9 bases.

Group A took each programme once.
Group B took each of the 7 and 8 bases twice.
Group C took 8-base four times.

The test included 6-base number operations. Group B was the best, being slightly better than A. C was significantly lower than these. The research demonstrates that a combination of breadth (as in A) with depth (as in C) is better than either alone, but that if this is not possible, breadth of learning will best promote an effective set.

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[1] Leith, G. O. M. and Clarke, W. D., Unpublished research on arithmetic learning sets. University of Birmingham School of Education, 1965.

The extent to which guidance from the teacher, or unguided discovery by the learner, helps in the transfer of concepts to new problem tasks has also been investigated.[1] When students were required to learn how to decipher coded sentences it was found that the best combination consisted of giving the rule but withholding the answer.

In general, guided discovery seems to yield the best results.

(vii) *The Facilitation of Complex Learning by Introductory Material and Summaries*

Several investigators, particularly Ausubel and his collaborators in their series of researches culminating in his text on meaningful learning[2] and Leith and his co-workers,[3] have examined the effect of preparatory material and of summaries on the effectiveness of learning complex material involving abstract and general ideas. Ausubel was concerned with various kinds of preparatory material on the learning of the history, literature, doctrine and ethics of Buddhism. He found that the best kind of preparation involved a comparison of Buddhism with Christianity with a view to highlighting the structure and idea of Buddhist belief. Such a preparation improved the later learning of the facts about Buddhism. Such introductory material, at a high level of abstraction, is called an advanced organiser and gives markedly better results than a mere historical preview or a mere exposition of the facts to be learned. Leith was concerned with the optimum position of preparatory material when the learners had two kinds of tasks, one relatively familiar, the other relatively unfamiliar. These referred to a passage on patrilineal kinship in social anthropology and an unfamiliar topic on matrilineal kinship and inheritance. He showed that the unfamiliar material was better learned when the preparatory material was interposed between two learnings. Opollot[1] compared the effects of massed and spaced preparation and massed and spaced summary on the effectiveness of learning kinetic molecular theory in a linear programme sequence. The summary was found to be more effective than the preparatory material and it was itself more effective in the spaced form, that is when it was distributed at four places during the learning sequence. These findings were consistent, whether the test of efficiency was an immediate one, whether it was delayed or whether it consisted of material calling for transfer from the learning task.

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[1] Wittrock, M. C. and Twelfer, P. A., 'Prompting and feedback in the learning retention and transfer of concepts', *B.J. Ed. Psych.*, XXXIV, 10-18, 1964

[2] Ausubel, D., *The Psychology of Meaningful Verbal Learning* (Grune and Stratton, N.Y., 1963)

[3] Leith, G. O. M., Unpublished Research Reports Nos. 4 and 9. National Centre for Programmed Learning, University of Birmingham School of Education, 1966.

Much remains to be done in this fascinating field of the learning of ideational material, but Ausubel's main point is worth repeating, that preparatory material in which comparisons are made, generalisations with other learning suggested, and in which the structure of the material to be learned is fully discussed, is likely to improve learning more than straight exposition. The general finding of Leith and others is that preparation and summaries are more effective if they are distributed through the material to be learned.

(viii) *Learning to Think*

Thinking is invoked whenever a person encounters a situation for which he has no ready-made response. He has to try out possible solutions, selecting and rejecting and making inferences. He may also have to decide whether the concepts he has already acquired may have any application in the new situation.[2] We have touched upon the learning of concepts, constructive learning and the process of intellectual adaptation, all of which enter into thinking, but now we look at the overall problem of teaching people to think. Can this be done? At least partially so, since whatever the problem, certain basic thought processes seem to be involved—the imagining of possible explanations, the selection of the correct ones, the capacity to relate explanations with the data of the problem in a logical way by inference and deduction. On the other hand, different subjects, like the sciences, mathematics, history and foreign languages seem to emphasise different aspects of concept formation and usage and so may entail different elements of thinking.

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[1] Opollot, J. A., Unpublished M.Ed. research, University of Birmingham School of Education, 1966.

[2] Peel, E. A., *The Pupil's Thinking*, Ch. I (Oldbourne Press, 1960)

One attempt, at least, to provide training in general problem solving has been successful.

Crutchfield and Covington [1] devised a training programme they claim trains ' for a *generalised* problem-solving skill '. Using programmed learning techniques they presented 13 lessons in which aspects of thinking, problem solving and detection were involved. In their own words,

> ' Inasmuch as our aim was to train for a *generalised* problem-solving skill, the problems did not pertain to specific curricular content, but dealt rather with a variety of mysteries and puzzling occurrences, such as the theft of a statue from a museum, and a case of strange goings-on in a deserted house.
>
> ' Each lesson posed a single mystery problem which the child was to solve. The lesson was constructed so that each child, by being given successively more clues and information, was finally led to discover the solution for himself. At various points in the story the child was required to restate the problem in his own words, formulate his own questions, and generate ideas to explain the mystery. Immediate feedback was given to his responses in the form of examples of other ideas or questions that he might have thought of in the given situation. These examples were primarily ones which fifth-graders would find novel and uncommon, and which would open new lines of investigation or new ways of viewing the problem. It was assumed that presenting numerous examples of this type would tend

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[1] Crutchfield, R. S. and Covington, M. V., ' Facilitation of creative thinking and problem solving in school children ', Paper presented in symposium on Learning Res. Pertinent to Educ. Improvement, *Amer. Ass. Adv. Sci.*, Cleveland, 1963

> to broaden the child's limits of acceptance as to what constitutes important questions and fruitful ideas.'

Each lesson was part of a continuous theme and required forty-five minutes. The children were then given the Duncker X-ray problem (see p. 209) with other problems, and it was found that of 98 children taking the learning programme, 35 per cent solved the X-ray problem, whereas, among a matched control of 97 children not so instructed, only 13 per cent were able to solve the problem.

Among the general properties of thinking worked into the programme by Crutchfield and Covington were the following :

(*a*) the necessity of identifying and defining the problem appropriately ;
(*b*) the importance of asking questions and of taking time for reflection rather than leaping to conclusions ;
(*c*) looking closely at details, looking for discrepancies ;
(*d*) the necessity of generating many ideas ;
(*e*) the necessity of looking everywhere for clues ;
(*f*) not being afraid to come up with silly ideas.

Another research worker, Suchman,[1] tackled the problem in a slightly different way and emphasised more clearly certain general classroom conditions necessary to promote the inquiring mind in children. He was disturbed by the degree to which school pupils leaned on the intellectual authority of their teachers with a growing atrophy of their own spirit of inquiry. He used films of simple phenomena in physics, with which the children were not familiar and which were discrepant with their previous experience—as in the bi-metal blade which bends differently as it is turned over in a flame. In Suchman's words,

> 'One of our films is about a bi-metal blade. When it is heated it bends downwards, and when it is inserted into a tank of water, it straightens out. The demonstrator turns it over and puts it back on the flame. This time it bends

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[1] Suchman, J. R. Inquiry Training : building skills for autonomous discovery. *Merill-Palmer Quart. Beh. Dev.*, 7, 3, 147-169, 1961. Suchman, J. R. The Illinois Studies in Inquiry Training. *J. Res.* Sci. Teach., 2, 230-232, 1964.

> upward and when placed in water it once more straightens out. To the children who don't know anything about a bi-metal blade, this is a discrepant event. They take it from there, using " yes " or " no " questions. They can't ask " was it because ". If they start getting into this kind of questioning we tell them it is their job to find explanations. " See if you can construct a theory. If you have one, you ought to be able to test it experimentally." Their experiments too are conducted through " yes " and " no " questions. " If we put the blade into a refrigerator would the same thing happen ? " Such a question is the equivalent of an empirical test of a hypothesised relationship. The responsive environment is created by the teacher who answers the questions. As the children ask questions they build little theories which they test themselves.'

The effects of this ' inquiry training ' appear to transfer to other fields, as in biology and economics.

As a result of his experiments, Suchman suggests three classroom conditions for the promotion of thinking by the pupil. They need the *focus* of a problem for which they have not a ready-made solution. They need intellectual *freedom* to gather information, to generate explanations, to test out ideas and to operate generally and widely. Lastly, they need a *responsive environment*—this must be largely created by the teacher who answers questions and produces immediate feedback of information.

(x) *Reading List*

BRUBACHER, J. S. *History of the Problems of Education*, Chs. VII and VIII (McGraw Hill, New York, 1947). These chapters contain a very concise account of the different methods of instruction used from early up to fairly recent times.

CRONBACH, L. J. *Educational Psychology*, Ch. 3—An Introduction to the Learning Process (Harcourt Brace, 1956).

STEPHENS, J. M. *Handbook of Classroom Learning* (Holt Rinehart, Winston, New York, 1965).

CRONBACH, L. J. The Nature of Learning. Ch. 4 in ROSENBLOOM, P. C., *Modern Viewpoints in the Curriculum* (McGraw Hill, New York, 1964).

(xi) *Exercises*

1. Obtain a set of Vygotsky blocks and carry out the test as instructed (see Vygotsky, L. S., *Thought and Language*, pp. 56-57 (M.I.T., Boston, 1962)).

Observe how the pupils learn the concepts involved. Then ask them to formulate the concepts.

2. Discuss this paragraph from *The Teaching of Mathematics in Primary Schools* paragraph 1.3, p. 4, Mathematics Association (Bell, London, 1955), in terms of the aspects of learning outlined in this chapter.

> 1.3. The importance of experience as the necessary foundation for the formation of these concepts and patterns of thinking is stressed throughout this chapter and in the chapters which follow. No amount of practice and rote-learning will take the place of this experience ; unless practice and rote-learning are concerned with ideas that have become ' a part of ' a child they will never lead to real understanding and mathematical thinking. Practice without the power of mathematical thinking leads nowhere ; the power of mathematical thinking without practice is like knowing what to do but not having the skill or tools to do it ; but the power of mathematical thinking supported by practice and rote-learning will give the best opportunity for all children to enjoy and pursue mathematics as far as their individual abilities allow.

3. Read the following passages on the teaching of foreign languages, from *Modern Languages*, Ministry of Education Pamphlet, No. 29, pp. 2-3 (H.M.S.O., London, 1956). What kinds of learning seem to be advocated ?

> So came into use the oral method, which aimed at keeping all that was best in the direct method—the thorough training in correct pronunciation, use and comprehension of the spoken foreign tongue—and combining it with the stern mental discipline of accurate written work which demanded a sound knowledge of grammar.
>
> The initial thorough training in pronunciation and intonation given by those who used the direct method must be retained, but the ability to read texts printed in phonetic symbols would not be regarded as essential to anyone but the teacher. Vocabulary—active vocabulary—must be built up methodically by hearing or seeing words in a context and using them : the memorising of long lists of isolated words was recognised to be of little value, but the regular committing to memory of carefully selected passages of good idiomatic language previously studied by the pupils was considered to be at the very root of modern language teaching.
>
> The reading book would no longer be construed ; comprehension could usually be assured by other more profitable means, such as the use of contraries, paraphrases or other explanation in the foreign language, using words already known, rapid blackboard sketches or gestures ; only exceptionally would a phrase or a passage be translated, unless in the fourth, fifth or sixth forms a passage were selected for careful rendering into English.

4. In the light of the following passage from the *Aims of Education* by A. N. Whitehead (Williams and Norgate, London, 1929), pp. 8-9, comment upon the relative value of the topics discussed in this chapter.

> I appeal to you, as practical teachers. With good discipline, it is always possible to pump into the minds of a class a certain quantity of inert knowledge. You take a textbook and make them learn it. So far, so good. The child then knows how to solve a quadratic equation. But what is the point of teaching a child to solve a quadratic equation? There is a traditional answer to this question. It runs thus: The mind is an instrument, you first sharpen it, and then use it; the acquisition of the power of solving a quadratic equation is part of the process of sharpening the mind. Now there is just enough truth in this answer to have made it live through the ages. But for all its half-truth, it embodies a radical error which bids fair to stifle the genius of the modern world. I do not know who was first responsible for this analogy of the mind to a dead instrument. For aught I know, it may have been one of the seven wise men of Greece, or a committee of the whole lot of them. Whoever was the originator, there can be no doubt of the authority which it has acquired by the continuous approval bestowed upon it by eminent persons. But whatever its weight of authority, whatever the high approval which it can quote, I have no hesitation in denouncing it as one of the most fatal, erroneous, and dangerous conceptions ever introduced into the theory of education. The mind is never passive; it is a perpetual activity, delicate, receptive, responsive to stimulus. You cannot postpone its life until you have sharpened it. Whatever interest attaches to your subject-matter must be evoked here and now; whatever powers you are strengthening in the pupil, must be exercised here and now; whatever possibilities of mental life your teaching should impart, must be exhibited here and now. That is the golden rule of education, and a very difficult rule to follow.
>
> The difficulty is just this: the apprehension of general ideas, intellectual habits of mind, and pleasurable interest in mental achievement can be evoked by no form of words, however accurately adjusted. All practical teachers know that education is a patient process of the mastery of details, minute by minute, hour by hour, day by day. There is no royal road to learning through an airy path of brilliant generalisations. There is a proverb about the difficulty of seeing the wood because of the trees. That difficulty is exactly the point which I am enforcing. The problem of education is to make the pupil see the wood by means of the trees.

5. Here is the aim of the Nuffield Science Teaching project as stated in October 1964:

> The programmes aim to give children a well-grounded understanding of science or a branch of science, not a knowledge of disconnected facts. Even at school it is not too early for young people to think about scientific things in the way that practising scientists do.

> Thus the objective throughout the Science Teaching Project is to encourage children to think freely and courageously about science. In the long run this will make for better scientists, better technologists, and more liberally educated people.
>
> An essential part of the philosophy guiding the Science Teaching Project is the belief that the best way to awaken original thinking in children studying science is to engage them in experiment and practical enquiry.

Consider this statement in the light of the aspects of human learning discussed. Which of these would appear to be most important for the Nuffield statement ?

CHAPTER IV

LEARNING BY INSIGHT

(i) *Introduction* (ii) *Gestalt psychology* (iii) *Formation of gestalts* (iv) *Insight* (v) *Good and bad insight* (vi) *Aids to restructuring insight* (vii) *Transposability and formal training* (viii) *Conclusion* (ix) *Reading list* (x) *Exercises*

(i) *Introduction*

IN the previous two chapters we have commented upon the bases of human learning in the terms of a learner making verbal responses to a learning situation (the stimulus). In Chapter III we considered how this stimulus-response learning model could be extended to account for meaningful and constructive learning and for the spread of learning to new fields. Although the experience of the learner, considered in addition to his behaviour and performance, was admitted as an element in such constructive response learning, it was not necessary to force the distinction between experience and behaviour.

Now we turn to an account of learning which is based wholly upon the experience of the learner—both in what he experiences through his perceptions and in what he remembers from previous learning. This view, through the findings and theories of gestalt (or configuration) psychology, provides us with an alternative way of explaining much of the learning described in Chapter III. Briefly gestalt psychology attempts to take account of experience, interest, insight, memory, constructive learning and transfer of training.

The gestalt psychologists emphasise the importance of our present experience in determining what we perceive and learn. They see psychological processes as functions of the present field, emphasising in particular the importance of the total configuration of the experience. According to their views, the gestalt or configuration is an experience of wholeness whose characteristics are determined not solely by the qualities of the parts, but also by the internal nature of the whole, the arrangement of the parts.

Less stress is laid on the influence of memory and past experience, but Köhler emphasised that memory operates, as the ' memory trace ', in simplifying or elaborating and interpreting the present experience of the viewer or learner. The memory trace has the effect of levelling down insignificant features of the whole pattern, of sharpening up important features and generally of *normalising* the experience, that is, giving it a meaning. Bartlett's classical work on *Remembering* [1] provides some of the most significant evidence ever collected in support of this view.

Adults perceive these wholes fairly readily, so readily, in fact, that the gestalt model of perception appears to fit perception and learning at all stages in the cognitive growth of the individual, but research on the experience of blind adults who had never seen previously, but then had their sight given to them, shows that when an entirely new experience is made possible, here, sight, the individual has to learn by the laborious process of association of parts and trial and error. So these adults had to learn to perceive simple shapes like that of a ball or an orange and learned it only slowly and laboriously. It seems then that the gestalt instance of apprehension by wholes gives us a picture of the mature learner only. We should note, however, that this description of mature learning would fit much of school learning.

(ii) *Gestalt Psychology*

Gestalt psychology is concerned in the first place with the problem of perception. It started as a reaction against the mental atomism of the nineteenth century which held that any perceptual experience could be reduced to elements composed of pure sensations. Thus we might analyse the delightful perceptual experience of a drink of iced lemonade into the sensory qualities of cold, wet, fruity, sweet, yellow, clear and heavy elements. But the gestalt psychologists would protest that if we took all these qualities away we should still have something left. And so would the drinker! They proposed that the experience of a phenomenon as a whole should be taken as the prime fact. As Katz writes, the gestalt psychologists base their science of experience on the philosophy of phenomenology. The phenomena shall speak for themselves. A gestalt or form is ' a whole whose characteristics are determined, not by characteristics of its individual elements, but by the internal nature of the whole '.

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[1] Bartlett, F. C., *Remembering : A Study in Experimental and Social Psychology* (Cambridge University Press, 1932)

The way in which the phenomena, wholes or gestalts, speak for themselves can be seen if we examine the problems of constancy of size, shape, colour and tone. Suppose we look down the street. The width of the street a quarter of a mile away ' looks ' the same as it is under our feet, yet the ' sensed ' width is smaller. This is an elementary fact of linear perspective. The older atomistic philosophy would have explained the result in terms of illusion and unconscious inference. The gestalt psychologist says that the judgment of the width of the street is a function of the whole scene which is before our eyes. This is an example of constancy of size. Similarly we may have an example of constancy of tone when we ' see ' a room with a uniformly white ceiling, although in fact the sensations received from the darkest corner of the ceiling are quite different from the lightest portion. We judge the tones constant in terms of the whole scene. Katz demonstrated this by devising an apparatus which enabled him to look at small patches of different parts of the ceiling through holes in an opaque screen. When this is done the tones *look* different.

Here is another very simple experiment which demonstrates the power of the whole phenomenon to affect our perception of any part. Suspend a 1-inch square of cardboard by a thread below and to the side of an electric lamp, so that the shadow of the square falls on a white sheet of paper. The shadow is seen as a piece of white in the shade. Now draw a thick line round the edge of the shadow with a very soft pencil. The square takes on the quality of a grey *colour* painted on the paper. The pencilled line has the effect of detaching the grey patch from the whole situation.

The peculiar quality which artists call ' direct vision ' enables the painter to analyse and break down the phenomenon into its elements. The artist has to be able to do this to create the illusion of reality in his pictures. One value of the frame round a picture is to detach a scene from the wider reality so that one can better appreciate its artistic qualities. Similarly it is an aid to the beginner in painting to look at any scene he wants to paint through a cardboard frame. By this means he breaks down the phenomenon from larger wholes and so is able to concentrate on the sensory qualities of the presentation before him. A related tendency is seen in what Thouless called *phenomenal regression.* When a child draws a tumbler the ellipse is often deeper than the actual stimulus perspective shape. The phenomenon, that is the actual ellipse the child draws or matches, seems to regress away from the perspective shape to the ' real ' character of the object, here a circle. Thouless called this ' *phenomenal regression to the* " *real* " *object* '.

Of course all that has been described could be explained by unconscious inference, but it is the gestalt psychologist's view that the tendency to form objects and phenomena operates from the start and is a prime quality of perceiving. As mentioned, recent evidence on the visual perception of adults who have had their sight given to them for the first time throws some doubt on this assertion. Whether this fact is true or not, the principle is still significant educationally, for at the level of school learning the experience of wholeness appears to be prime.

In Wertheimer's words, the characteristics of any gestalt are determined not only by its parts but also by their internal arrangement. Also, the quality of each component is itself determined by the whole of which it is a part.

We may now inquire whether there is any evidence for these assertions in the *facts* of perception. There are four commonplace perceptual phenomena which support Wertheimer's view. First, there is the familiar fact of optical illusion.

In Figure 8 the lines KL and MN are straight and parallel. The optical illusion serves to illustrate how strongly our perception of parts are influenced by the wholes containing them.

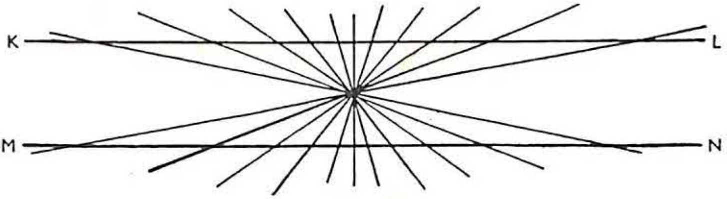


FIG. 8

Secondly, if we take away part of a whole or add to it, we perceive a change in quality of the whole which is not commensurate with the subtraction or addition effected. Look at Figure 9.

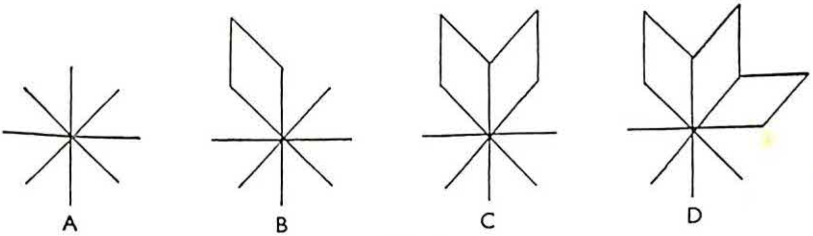


FIG. 9

In each case two lines have been added. There is, however, a change in the inner quality of the figures : A is a star of lines ; B contains a plane figure ; C holds a suggestion of three dimensions ; D has the appearance of a folded paper. The gestalt psychologists described this sort of phenomenon under the law of intimacy (Innigkeit), and it demonstrates that a perceptual whole is more than a sum of its parts.

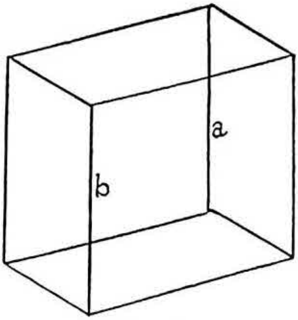


FIG. 10

Thirdly, we have the familiar phenomenon of ambiguous figures in which first one part of the form predominates and then another. In Figure 10, first edge 'a' appears to project and then edge 'b' and so on. Here we have evidence again of the strong influence of the whole on the perception of any part.

Lastly, we often notice that the relationship between the colour and tones of different objects remains the same in good and poor lights, in daylight and in electric light. Also the points on a circular object, as in Figure 11A, are 'seen' in the same relative positions if viewed at an angle as in 11B.

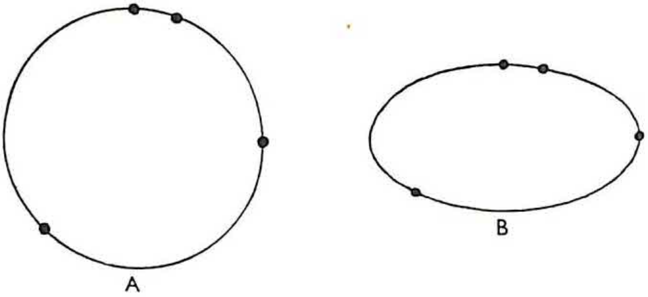


Fig. 11

The gestalt psychologists collected such phenomena under the heading of the law of transposability, and it is demonstrated by the famous chicken experiment (see Figure 12). Chicks were trained to feed at the signal of the paler of two greys (X). They were then given the signal B, where the former paler grey (X) is now the darker, being paired with an even lighter grey (Y).

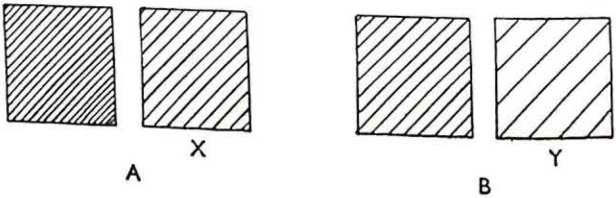


Fig. 12

The chicks now pecked at the new pale grey (Y). The experience which had been transposed was not the element (the single grey) but the whole pattern or configuration.

The transposability of tone patterns, colour patterns and spatial designs may break down if the new conditions are extremely diverse from the original ones. Thus if we compare a colour pattern in red and blue light or in strong daylight and near darkness or if we compare the plan of a spatial arrangement with an extremely fine projection of it, we may find difficulty in transposing the whole configurations. This is well illustrated in the well-known picture by Holbein, *The Ambassadors*, in which he painted an extreme projection of a skull, as a play on his name, across the foot of a large canvas. Only the initiated recognise the odd shape as that of a skull painted from an odd angle.

However, the four types of instances serve to demonstrate the power in visual perception of the whole configuration over its parts.

(iii) *Formation of Gestalts*

We may now consider the laws underlying the formation of gestalts or whole configurations and the factors which influence their formation.

Koffka tells us that configurations tend to become as clear as the conditions allow. We tend to search for figure-clarity against the ground. Psychological organisation is always as 'good' as circumstances permit. A 'good' form implies unity, harmony, inclusiveness and conciseness. This tendency is shown in many perceptual and cognitive situations, whenever new material is studied. All but the 'good' essential features are omitted. For example, when painting a landscape it is often a good plan *not* to paint direct from the scene, but to paint it later from memory. The process of forgetting removes irrelevant details, and the picture takes on a clearer composition and design. Details are flattened or sharpened according to whether they are trivial or relevant.

'What determines the dominant pattern may be the spatial or ideational pattern or the motives and interests of the observer.' What he has learned previously and remembered and what he has acquired from his social group (see Bartlett, F. C., *op. cit.*) also affects the configuration perceived.

The law of the organisation of the 'good' gestalt is called the law of precision (Prägnanz). There are several factors which make for the formation of a 'good' gestalt. These include similarity and proximity of elements as shown in Figures 13 and 14.

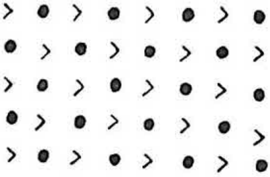


Fig. 13

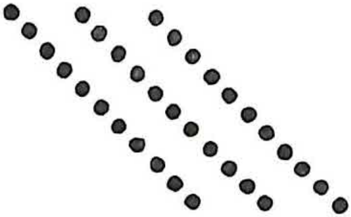
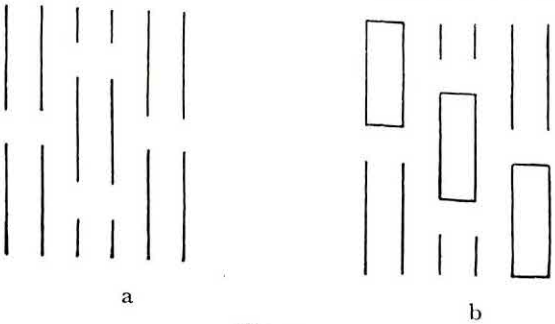


Fig. 14

In the ideational field these conditions seem to resemble some of the factors mentioned in the last chapter as making for association of experience and ideas.

Closed figures are more readily perceived than open figures. In fact, the predisposition to form a gestalt often leads the observer to close figures which are partially open. This is a principle of artistic composition and design. It is the business of the artist to suggest closed forms, for this helps to give his work unity. He does not necessarily strive *consciously* after closed figures. The fact that it is difficult to do otherwise is further proof of the primacy of gestalt organisation.

In teaching it is also the business of the teacher to present his problem in such a way as to leave some closure on the part



a b

Fig. 15

of the pupil. A lesson can be overtaught, that is, overclosed. Something should be left to the activity of the pupil. The problem is to leave the optimum, avoiding overclosure on the one hand, but not leaving so much to the pupil that he is discouraged. An example of the organising power of closed forms is shown in Figure 15b. Components of a figure which have a 'good' form tend to form a unit. In Figure 16, part 'a' forms a closed unit clearly defined by its 'good' form. In the arts of sculpture, painting and architecture the artist's designs and compositions are influenced by this factor. Also, if a 'good' form is hard to perceive in a painting, the latter may lose some of its value to the appreciator.

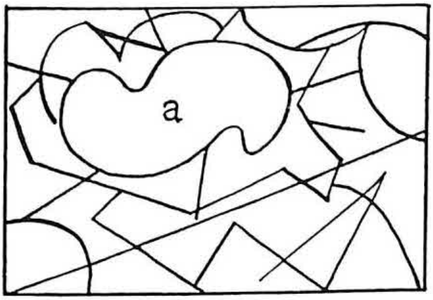


FIG. 16

Also aiding clarity of form is the experience of the observer. He tends to give meaning to configurations set before him in terms of what he has learned and is interested in. This condition seems to be very close to what Herbart (see Adams in the reading list) called apperception. The experience was called the 'apperception mass'. Our present perceptions are governed to some extent by our knowledge and attitudes. The lines of Figure 17 may prove difficult to organise into a 'good' form,

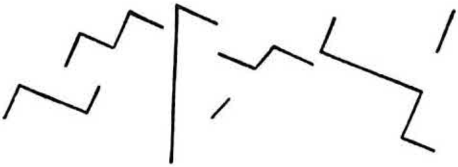


FIG. 17

but when they are rearranged as in Figure 18, experience organises the perception into a form which is very easy to ' see '.

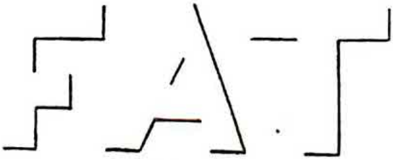


FIG. 18

Similarly, in the case of Figure 19 we see church windows or penguins, and in Figure 20 a negro or a horned devil, as our experience actively organises the configuration.

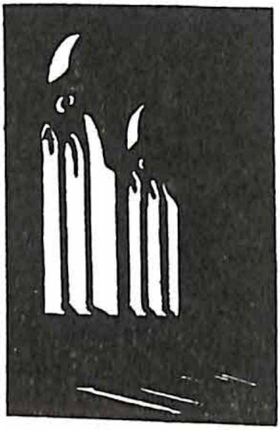


FIG. 19

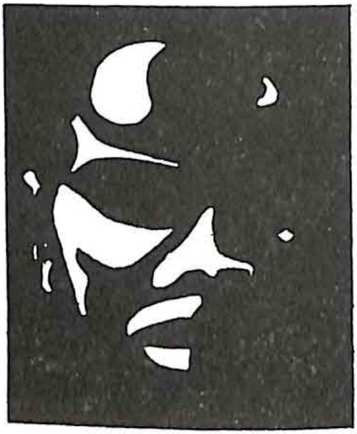


FIG. 20

As already stated in section (i), past experience has the effect of giving a configuration or pattern significance.

The reader may be remarking that, interesting as the gestalt theory of perception is, he wonders what are its applications to teaching. The answer is that Koffka's law of precision—that we organise our perceptions into as ' good ' a configuration as conditions allow—also applies to cognitive experiences. Experience not only organises perceptual situations but also the cognitive and learning situations of the classroom. In presenting new material the teacher takes advantage of this experience, using it to ' structure ' the gestalt in the best way for achieving the desired learning. When a learner is confronted with a new situation he tends to give it form and clarity. The form he gives it, is such as to satisfy him—the gestalt must be ' good ' to him. However, such a gestalt may not be ' good ' in the sense of leading to correct knowledge. This is where the teacher comes in.

When we discuss the learning situation in terms of gestalt theory we normally use the word ' insight ' instead of ' gestalt ' and frequently talk of ' structuring ' or ' restructuring ' the insight instead of organising it. Thus at the beginning of a series of lessons and exercises on simultaneous equations the pupil will have a rudimentary insight, perhaps false, but none the less ' good ' to him, into what the equations imply and how to solve them. During the course of the lessons this first insight may be modified or restructured, so that the full application of simultaneous equations will be comprehended and a greater capacity to solve them will be developed. In the beginnings of learning, our ' insights ' are hazy, diffuse and unstructured, as in the case of our first knowledge of the streets of a strange city. In the course of experience, by repetition, analogy, analysis and practice, the ' insight ' becomes clearly structured, the parts related to each other and the whole. Thus after some time in the strange city we can find our way about easily, knowing enough to anticipate where unknown streets will lead us.

(iv) *Insight*

Köhler noticed that apes learned to overcome obstacles to feeding in a way that resembled human behaviour rather than the learning behaviour of rats and cats. They were able to turn away temporarily from their goal to find improved means for reaching it.

This ' detour ' character of insightful behaviour is one of its most important features. The individual who is capable of such learning can look at the *problem* in a detached way. He is able to leave the goal for a time in order to move outside of the whole situation. This capacity has complex roots, for the learner is not so dominated by the goal ; he is busy and confident to some extent in his search for better methods. The reader may recall examples from his own experience in solving, say, algebraic problems, in order to illustrate these suggestions.

Hilgard gives a list of characteristics of insightful learning. Insight calls for intellectual ability in the learner. Generally speaking, the insights required of dull children should be simple. In fact, much of the learning of very dull children may be regarded in the light of stimulus-response learning and reinforcement. (See the previous two chapters.) The very able child, on the other hand, will gain most from insightful learning, but it is not enough to present a child merely with the elements and symbols contained in a situation. He must also know something of the method of attack of the problem, the important features and the structure of the situation.

This is well shown in problems, say, in elementary physics and mechanics. It is not enough to know formulae, symbols, units and dimensions. The relations of these things to actual problems and the method of using them are the important requirements. No subject illustrates this better than school geometry, particularly that part given over to solving riders. The pupils may know the theorems very well which are involved in solving any one rider and still not be able to prove the rider. The relation of the theorems to the whole rider has to be understood and a method of attack developed and learned. Duncker's distinction [1] between organic and mechanical proofs of geometrical problems brings out the need to know more than relevant theorems in solving a problem.[2] In the organic method of solution, the pupil proceeds by restating the original problem, then by asking what it really means and what is necessary to solve it. In mechanical solution he begins by asking first what is given and what theorems may be applied. In early learning by insight it is important that *all* aspects of the problem situation are accessible. By these means he arrives at the first structure of the situation.

Other tests of insightful learning are that the learned process may be repeated and that it can be used in new situations.

All these qualities are tests of insight, but some are better than others. Thus the importance of previous *relevant* experience, the need for all the aspects of the situation being open to observation, the view that insight follows trial and error learning, and that insightful solutions can be repeated could be evoked as supporting the concept of learning by reinforcement. All these tests are *behavioural* tests. We need take no spoken record from the learner of his experience and intentions. The test that the learning can be repeated and used in *new* situations is a better one, but even in this case the evidence might be held to support stimulus generalisation. The only *real* test is from the recorded experience and stated intentions of the learner. Any evidence from animal and child behaviour, convincing as some of it appears to be, is inferential.

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[1] Duncker, K., On Problem Solving. *Psych. Mon.*, *58*, No. 5, A.P.A., Washington, 1945

[2] Peel, E. A., *The Pupil's Thinking*, p. 163 (Oldbourne Press, 1960)

I have deliberately stressed the experiential aspect of insight as opposed to the behavioural aspect of reinforcement, since the laws of gestalt psychology are laws of experience, genuinely psychological in the sense defined by Russell[1] and touching upon uniquely human facts.

(v) *Good and Bad Insight*

When new material is presented to us or whenever we have fresh experiences we tend to give them meaning or structure. Just as nature abhors a vacuum, so humanity cannot tolerate structureless experience. The underlying principle of gestalt psychology is that each individual is *active* in his efforts to organise and give good structure to his learnings. The test for this kind of 'goodness' is the satisfaction it brings to the learner. But the background of the learner is limited and so a 'good' structure for him may not be 'good' in the sense of being consistent with contemporary knowledge.

Thus we have the case of the boy first learning about graphs of equations in y and x. The teacher has talked of the y-axis. The boy may be dull or uninterested or the lesson may not have been well given. Whatever the cause, the boy has misinterpreted the teacher's words 'y-axis' to mean 'y-x's'. Here is a simple case of structuring by the pupil to give a good insight in the sense that the subject of the lesson concerns y's and x's, and 'y-x's' fits into this pattern. It gives the pupil a fleeting but quite erroneous satisfaction. Viewed from the objectives of the teacher it is a ' bad ' insight, one which he will have to restructure. The importance of this small incident is that it illustrates the active organisation which goes on in the pupil's mind when he is presented with new material and experiences.[1]

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[1] Russell, B., *Human Knowledge*, Ch. VI (Allen & Unwin, London)

Another instance was reported as follows, by one of my research students :

> ' In helping a child to restructure his insights it is necessary to ensure that the child has the necessary relevant previous experience to enable him to do so. During a series of lessons which arose out of the recent " Journey into Space " I was surprised to be asked by a child of twelve, " If the Martians land on the earth how will they get in to where we are ? " Lacking the necessary previous experience she had decided from listening to the serial that the earth was an enormous sphere containing the sun and stars, and that we lived on the inside surface of this sphere. The Martians coming from " Outer Space " would land on the outside of the sphere and would have to make their way, somehow, through to the inner surface. At the time, this was, to her, a " good " gestalt and had satisfied her, but she became puzzled about its adequacy to explain the situation as the serial had progressed. A very short demonstration with a globe was sufficient to show her the true state of affairs, and to satisfy her and enable her to restructure her insight, but it illustrates how only a fortunate remark enabled me to see her difficulty and how much better it would have been to have given her the basic experience earlier.'

In a sense all learning is not ' good ' in that it is provisional and the insights can be improved. The development of the body of knowledge we call natural science is that of provisional insights becoming ' better ' in the course of experience. So the youngster who, on being shown experimentally that an immersed body weighs less in water than in air, offers the explanation that dissolved air in the water is making the body more buoyant, forming perhaps no ' worse ' an insight than the early phlogiston theory of combustion or the geocentric theory of the universe. Each is ' good ' in its time and place, but each is ' bad ' in the sense that it may lead to futile action or that it is incomplete and can be subsequently improved.

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[1] There is also the story (apocryphal ?) of the Black Country pupil who when asked to repeat the commandment ' Thou shalt not commit adultery ' answered ' Thou shalt not come into Oldbury '.

The role of the teacher becomes clear in the light of our discussion of the organising activity of the pupil. The activity will go on whether the teacher guides it or not. The function of the teacher, is, therefore, to restructure the primitive insights of his pupils, and to avoid supporting or merely *ignoring* ' incorrect ' insights. Restructuring implies positive action with respect to false insights.

Thus whilst it may be premature for the science master to give a rigorous formulation of the principle of Archimedes in the early stages, he should correct actively the ' bad ' insight that a body becomes lighter in water because of the air dissolved in the water. He can boil out the air. He can draw upon further experiences of ships floating, of floating objects in mercury or of the different results obtained when an empty beaker is half buried, as in the diagram, in (*a*) dry sand, (*b*) wet sand.

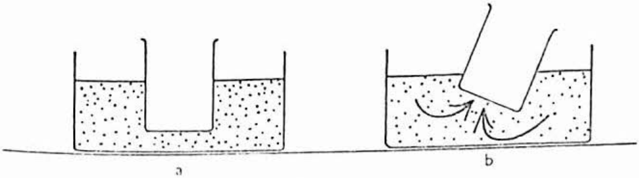

FIG. 21

By referring to these further experiences and insights, the learner may restructure his initial ' bad ' insights to achieve the ' better ' provisional solution, that water tends to find the lowest level and that the fluid tends to force the object upward. This is still far from the exact formulation of Archimedes' principle, but it is pointing in the correct direction.

Not all learning proceeds from ' bad ' insights. In English and history it develops more often from correct but relatively unstructured insights. Here are examples. A teacher was taking a poetry lesson with a class of very bright girls. They were reading a ballad about Robin Hood. At the beginning of the lesson the teacher asked if any girl knew the poem and could outline the story. One girl gave a brief outline in a couple of sentences. Here was the first insight for many of the other girls. It was relatively unstructured but it was not a 'bad' insight. Then the teacher read the poem aloud and later the class acted it. The structure was becoming much clearer, and in the course of the reading and acting, unstructured parts, such as words and phrases which the girls did not understand, were beginning to emerge. At the end of the acting one girl asked for the meaning of a word, and this let loose a stream of questions and answers which further structured the whole experience.

Similarly, in the learning of history we may begin in our childhood with relatively unstructured and perhaps some quite false insights associated with names of national heroes like Drake, de Montfort, and the Black Prince, or with national institutions, the monasteries, the Star Chamber. These insights are developed and restructured by the teacher who makes use of all that textbooks, archives, architecture, ancient buildings and ceremonies can offer.[1]

No school subject offers better examples than mathematics to illustrate how active the teacher must be in this process of structuring and restructuring. Here are examples taken from the elementary algebra of fractions. In a fractions test all pupils solved correctly such exercises as $\frac{2a}{2} = a$. Almost all gave the correct answer to $\frac{4}{2a}$, but there were many failures in connection with the simplification of $\frac{6}{6a+6b}$. Here are samples of wrong answers:

$$a+6b,\quad \frac{0}{a+6b},\quad a+b,\quad 6a+b,\quad \frac{1}{a+6b},\quad \frac{1}{6ab}$$

These answers show lack of structural insight into the meaning of division by fractional methods, of the relation of numerator to denominator and of the associative rule, symbolised by : $ax+ay=a(x+y)$.

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[1] See E. A. Peel on Psychological Problems in the Teaching of History, pp. 159-190 in *Studies in the Nature and Teaching of History*, eds. W. H. Burston and D. Thompson, Routledge & Kegan Paul, 1967.

When we turn to examples from a *single* pupil's work we can see quite clearly how imperfect the insight can be :

$$\frac{a^2}{ab}=\frac{a}{b}\quad\text{correct}$$

$$\frac{6}{6a+6b}=\frac{1}{a+b}\quad\text{correct}$$

$$\frac{3}{6a+b}=\frac{1}{2a+b}\quad\text{incorrect}$$

$$\frac{3a-b}{b}=\frac{3a-1}{1}\quad\text{incorrect}$$

$$\frac{3a+3b}{a+b}=\frac{3+3}{1+1}=\frac{6}{2}=3$$

'correct' answer (*sic*) but a 'bad' insight.

The reader is referred to Wertheimer for other excellent examples from geometry, trigonometry and algebra. The danger of *excess* drill work *limited* to simple fractions of the type $\frac{6a}{2}$ is quite clearly demonstrated. Gestalt psychologists are critical of the blind 'stamping in' of processes which tend to restrict the restructuring of more comprehensive insights. The examples in drill work should always be mixed and graded to develop and enhance the desired structure.

We may take another example from the teaching of foreign languages. We wish to bring about 'a good' insight into the rule for adjective endings in German. Sentences or short pieces of very simple prose are first given, which exemplify the use of German adjectives when they are preceded by the indefinite, the definite article, or no article at all. From a discussion the need for strong and weak adjective endings is brought out. As in the case of mathematics, excessive drill work in any *one* type of ending might interfere with the organisation of the desired structure. In this example the teacher would also make full use of the conventions with regard to adjectives in English and in any other language the pupil was studying. As Stephens states ' the role of the teacher is to present whole patterns first and then relate any new information to them ', thus ' structure presented at the outset should be the structure which can be readily or immediately appreciated by the students '.

(vi) *Aids to Restructuring Insight*

Anyone who has tried to improve a skill such as swimming, batting, playing a tennis stroke or even chopping wood, will have noticed that improvement in the skill can be brought about by analysing the parts of the skill and by relating these parts to each other. Thus the injunction that one keeps the head well down in the water, that one holds the left elbow up in a forward defence play in cricket, that one pulls upwards and forwards to give a tennis ball top spin, and that one swings the axe close to the ear, each improve the insight into the skill being practised. Furthermore, verbalising these ' tips ' the repetition of them in the mind or even out aloud during play—adds to their value. Judd,[1] showed how important it is to generalise and verbalise in his experiments on throwing darts at under-water targets. He compared the performance of a control group who had no instruction and that of an experimental group to whom explanation had been given on the principle of refraction of light. The latter group showed the better performance. Similarly, the reader may try the effect of verbal generalisation in mirror writing or in carrying out in a mirror any familiar operation normally undertaken by direct vision.

The value of verbalising important aspects of a skill goes far beyond the execution of motor skills. The painter who seeks to produce certain effects of colour, tone or perspective, does so in terms of a *verbalised* insight. He knows which colours mix in certain ways and which lines will produce the desired perspective effects. Similarly, if we turn again to the algebraic fractions which have been produced as examples of failure to achieve insight, we notice that one way of lessening the chance of failure is to ask the pupil to verbalise the operation required. Thus, for $\frac{2a}{n}$, he may describe this operation as follows : double a number and divide it by another. For $\frac{6}{6a+6b}$ he may say : take six times one number, add six times a second and divide the *total* into six. Or it may take the form : when there are several *added* components to the denominator (or numerator) of a fraction, any cancelling must apply to *all* components. Lastly, such a statement as, $3a+3b = 3(a+b)$, can be verbalised to give the real meaning of this identity. The modern teaching of the beginnings of algebra makes great use of the equivalence of the symbolic and verbal rendering of an operation or statement.

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[1] Judd, C. H., *Educational Psychology*, p. 514 (Houghton Mifflin, New York) See also Skinner, C. E., *Educational Psychology*, p. 534 (Staples, London)

Verbalising insights which are in the main motor, perceptual or symbolic can lead to enhanced structuring.

Conversely, insight into learning that is essentially verbal or symbolic in character is strengthened and restructured by *modelling* the structure. Thus many of the insights required in theoretical physics are better grasped when models of them are presented. The same is true of much of elementary and advanced algebra and the calculus.

The reader may test for himself the value of schemata in modelling such excessively verbal studies as psychology, education and history! In school history the grasp of connected events and genealogical relationships can be greatly strengthened by charts and diagrams.

The whole topic of illustration and visual aid is one of aiding more abstract insights by the use of concrete pictorial or graphic models. The model ceases to aid the desired structure when it becomes itself too complex. The teacher's task is to model verbal and abstract insights to such a degree that the structure of the models themselves enhances but does not compete with the insight which is to be brought about.

M. D. Vernon [1] investigated the value of pictorial illustration for the instruction of children and showed that the production of a coherent argument is a much more important factor than the support of the text by pictorial and graphical material. She could find very little marked general superiority of illustrative over non-illustrative material. Such findings need to be kept in mind when a text is illustrated.

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[1] Vernon, M. D., 'The Instruction of Children by Pictorial Illustration', *B. J. Ed. Psych.*, **24**, 171-179, Nov. 1954

(vii) *Transposability and Formal Training*

The gestalt law of transposability has already been referred to when we considered the laws of perceptual experience. According to this law the whole pattern of experience may be transferred from one setting to another. The analogy is a simple example of the transposability of a cognitive configuration. So we have : horse : hoof :: man : ? (foot).

The cognitive configuration relating *horse* to *hoof* is transposable to the new situation involving *man*, and the word *foot* is evolved as the fourth term of the analogy. We see the same sort of thing when a pupil successfully applies the fractional operation $\frac{a}{b}$ to such examples as $\frac{6a}{3a+3b}$ and $\frac{15a-10b}{3a-2b}$. But as we saw in the examples quoted earlier transposability is not achieved without some effort and trouble on the part of the learner and teacher. The fact that parts of a whole configuration may be transferred gives rise to much mislearning as, for example, in the incorrect simplification, $\frac{6}{6a+6b}=\frac{1}{a+6b}$.
The configuration comprehended by the pupil is not complete.

Other examples of transposed insights occur when a student applies methods of study acquired in one subject to another, or when the inductive method of science is applied to everyday situations. Personal traits such as honesty may also be transposed. This occurs when a person is honest in all situations. Transposability is at the root of the problem as to whether character traits are general or specific. Further evidence of the transposability of insights is revealed in invention and creative activity. The inventor is capable of seeing established insights in new settings.

The problem of transfer has occupied psychologists and educators for a long time. It appears under the names of formal training, mental discipline, and transfer of training. It was one of Plato's canons :

> ' Further have you ever noticed that those who have a natural capacity for calculation are, generally speaking, naturally quick at all kinds of study ; which men of slow intellect, if they are trained and exercised in arithmetic, if they get nothing else from it, at least all improve and become sharper than they were before ? '

The theory of mental discipline holds that the content of studies is relatively unimportant compared with the effect they have in training the mind. Reasoning is trained by learning mathematics, memory by learning history, Latin disciplines thought, and anything unpleasant is good for small boys!

The reader may refer to the short remarks on faculty psychology (Chapter VII) and note that the doctrine of mental discipline rests on the assumption of independent faculties such as memory, reasoning and observation, which can be exercised by learning relevant material. It is quite clear that if there is anything in the theory it must involve the transfer of insights and configurations of thought from one field to another.

The theory dominated nineteenth century educational thought and at the turn of the century James, Thorndike and Woodworth tried to test it out. James concerned himself with memory and attempted to discover whether learning poetry—the first book of *Paradise Lost* learned in 36 days in daily periods of 20 minutes—could improve his capacity for learning poetry by Victor Hugo. Before learning *Paradise Lost* he learned 158 lines of Victor Hugo in 132 minutes spread over 8 days, and *afterwards* he could only learn the next 158 lines in 151 minutes. He ascribed the fall-off to fatigue! There was no evidence of transfer.

Thorndike and Woodworth tested whether one could train judgment of lengths, weights and areas and obtained no positive results. In England, Winch tried to train memory of history by learning poetry. He obtained only a slight amount of formal training. Sleight also tried to train memory by learning poetry, arithmetic tables and the meaning of prose passages. He obtained no effects.

The research of James, Thorndike and Woodworth was one of the causes which led to the change in the American school curricula. Since no subject has value in training anything else, there must be as many subjects as are useful in life. This influence is still very obvious in American education, but in England, we have tended to subscribe to a belief in formal training, whatever we *say* about it.

Following upon these experiments in the early part of the century, many investigations were carried out in the transfer of training from one school subject to another. The general pattern of this type of research is as follows :

An initial test in the subject to be ' trained ', say Latin, is given before the period of training—such training to be by practice in French. This test is given to both the control and the experimental groups and is called the first cross-section

	Control group No practice in French ↓	*Practice group* Practice in French—the subject whose transfer value is being investigated ↓
2nd cross-section	Latin test	Latin test
	↓ *Practice group* Practice in French ↓	↓ *Control group* No French ↓
3rd cross-section	Latin test	Latin test

The ' control ' and ' practice ' groups of children are changed after the second cross-section. The cross-section tests (in Latin) have nothing to do with the practice subject (French).

The most extensive of these experiments was one carried out in the schools of New York State by Thorndike, who compared the influence school subjects have on general attainment and capacity. There was very little difference between the subjects but the evidence was slightly in favour of *Latin.* Latin, mathematics, chemistry, history, had slight positive transfer value. Cookery, drawing, business, civics, showed slightly negative results.

Experiments of particular interest to gestalt psychology are those due to Judd, already outlined on page 92, and Johnson,[1] who investigated the effect of learning geometry on logical, legal and scientific reasoning and on solving some detective problems. She had three groups of children: a control group, a group who learned geometry along traditional Euclidean lines and a third, given special geometry in which the emphasis was laid on learning to reason, where the nature of induction and deduction was analysed, and in which the children were made 'method conscious'. No reference was made to applying the concepts to fields other than geometry, save in the case of the conception of an axiom, when it was done with both groups. The results were as follows.

3 groups of children of equal age and I.Q.

First test (general reasoning test, not geometrical)

special geometry group	conventional Euclidean geometry group	control group
↓	↓	↓
Second test % improvement on first		
139%	12%	11%

The groups were then rotated and the first results confirmed. Conventional geometry is no better than no geometry at all for training reasoning.

The experiments of Judd and Johnson have special significance for our theory since each worker was clearly concerned with structuring the insights of the experimental groups of children.

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[1] Johnson, E. P., 'Teaching Pupils the Conscious Use of a Technique of Thinking', *Maths. Teacher*, **17**, 191, April 1924

Later workers applied ' insightful ' methods and included Meredith on the effect of science instruction on poetry learning, and Ruger on the effect of practice in Chinese puzzles on other puzzles. Their results also confirmed that insightful learning is the only type that leads to transfer.

In general there are two main views about transfer of training. First there is the view held by Thorndike and his co-workers. All learning is specific. If there is any carry-over there must be identical elements in the two fields of learning. These elements are of a perceptual character. This is Thorndike's theory of Identical Elements.

Secondly, there is the view that carry-over is possible in so far as there are common elements of method of thought and procedure and of learning habits. Judd has emphasised the importance of generalising the techniques. This is closely akin to verbalising the insights. Other writers have emphasised the need for common attitudes to both fields and the importance of this for the carry-over of ideals, for example, of neatness (Thomson) or honesty. Yet again there is Cronbach's distinction between substantive transfer, of actual learned material, and aptitudinal transfer, of method of thinking and learning, discussed in Chapter III, Section (vi).

Other writers insist on the importance of following up principles consciously and conatively. Thus Burt writes that the ' common element is more likely to be usable if the learner becomes clearly conscious of its nature and of its general applicability. Active or deliberate transfer is far more effective and pregnant than passive automatic or unintentional transfer. This seems to be especially true where the common element is an element of method rather than of material.'

In conclusion we can say justifiably that, in so far as we are concerned with the cognitive aspect of learning, *transfer of training is most possible when there has been active structuring of insights and that the carry-over of learning from one field to another is an example of the principle of transposability of insights.*

(viii) *Conclusion*

Gestalt psychology is concerned with experience and provides us with laws of perception and learning of particular interest in problems of human learning. The implication is that the learner is active in organising and re-organising his perceptions and thoughts. The wholeness of experience is stressed and laws are developed which show how gestalts or whole configurations are formed. There is the law of the good gestalt—that we tend to organise experiences in a way that is ' good ' to the individual ; thus unessential details may be omitted and incomplete parts completed. The tendency to form clear configurations is a very active one and may lead to results which are not compatible with our wider knowledge. It is here that the teacher comes in. According to gestalt theory his main function is to help the learner to re-organise his experience and learning. There are several factors which make for the formation of a ' good ' gestalt ; some of these are spatial and logical, such as similarity and proximity. The experience of the learner also plays a large part in this formation.

According to the theory the learner may look at a problem in a detached way and is not so dominated by the goal as in simple behaviour learning. This detached analysis we call insight, and insightful learning forms the basis of all school learning and may be illustrated by material from every lesson. Learning may proceed from bad insights or from incomplete insights, and it is the teacher's role to re-organise or restructure these insights so that good learning is finally achieved.

When a skill is being acquired, insight into it can be greatly aided by analysing the parts of the skill and by *verbalising* them. When we are acquiring verbal or abstract knowledge the insight may be aided by *modelling* the abstract knowledge, as when we use visual aids to help, say, history teaching.

Insight is also seen to be the necessary condition for knowledge and other learnings to be transferred from one field to another. The whole question of transfer of training and formal discipline turns on the extent of the insight of the learner.

(ix) *Reading List*

KOFFKA, K. *The Growth of the Mind* (Harcourt Brace, New York, 1925).
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(x) *Exercises*

1. Take any games of skill with which you are familiar and indicate parts of the skill which may be verbalised in order to facilitate learning.

2. How would you teach the four rules in fractions assuming that your role as a teacher is to restructure your pupil's insights. (Assume that the pupils know how to reduce a fraction to its lowest terms and how to find the L.C.M.).

3. Study a passage with which you are not familiar from the writings of any philosopher or the popular works of any scientist and note the progress of your insights into the material you choose to read.

Suggested examples · Dewey, B. Russell, H. Poincare, Eddington, Aitken (Chapter 1 of *Determinants and Matrices*), Einstein on Relativity (*see* Wertheimer · *Productive Thinking*, Ch. VII).

4. Observe a young child's play behaviour and make a list of evidence that points to insightful behaviour.

CHAPTER V

THE MOTIVATION OF LEARNING

(i) *Some elements in motivation* (ii) *Human drives and needs* (iii) *The urge to learn* (iv) *The palpable consequences of learning: after-effects; secondary reinforcement; reward and punishment; feedback of information* (v) *Performance and standards* (vi) *Level of aspiration* (vii) *Reading list* (viii) *Exercises*

(i) *Some Elements in Motivation*

When we were discussing learning as reinforcement in Chapter II we drew attention (Section (ix)(*c*)) to the key role of the consequences of the learner's response. These consequences or effects shape his further progress. We mentioned a particularly important kind of learning consequence in the feedback supplied to the learner by the teacher or any other member of his audience and by the learning situation, as in the stalling of a car engine after a bad release of the clutch. These are factors in the motivation of learning. In our discussion of reinforcement so far we have assumed that the learner will respond to a stimulus and have begged the question as to what impels him to make that response. We must now try to deal with this question.

Motivation of learning involves several things. First the learner has to feel an urge to learn. This urge may be based on basic appetites, drives and needs, such as hunger or discomfort or avoidance of danger and hazard, in the latter case, as in learning to drive a car competently in modern traffic conditions. The urge may be more sophisticated as in the drive to win a game, to satisfy parents and teachers or to win approval from team-mates. The drive may be yet more remote and long term as in studying for a degree, or in pursuing research and scholarship for the sake of progress in them.

We may note that unless there is an urge to learn of some kind, then the after-effects or consequences of the learning are less likely to be effective in improving the learning. Unless the learner is committed, whatever the grounds of the urge, he is not likely to be too worried by success or failure or comment by his teacher.

The second ingredient of motivation is the large class of after effects and consequences of the response made by the learner. As suggested in Chapter II, Section (ix)(*c*), these are varied. They include reduction of needs, like hunger, thirst, or of feelings like anger, fear. They include enhanced pleasure and the satisfaction of curiosity and its further revival. They include reward and punishment, and information as to progress in learning.

Lastly, motivation is linked with the relation of actual performance and the standards set by the learner himself. A motivated learner making progress against difficulties will tend to set his sights higher or lower as he succeeds or fails. If he lacks motivation he may drop his standards altogether. The subtle balance between over-motivation, motivation and under-motivation have to be observed by the good teacher. This is not easy to do with a class of 30-40 individuals all at different stages of learning, say, in arithmetic or foreign languages. Class progress may mean a really challenging situation for some, for others it may be too much and for the ablest may not constitute a sufficient challenge.

(ii) *Human Drives and Needs*

Experiments on learning, especially those on animals in simple learning situations, confirm that much learning takes place when the learner is driven by his appetites and needs. Hunger, thirst and the avoidance of injury and pain have all been demonstrated as *primary drives* in learning. The primitive curiosity whose function is to protect and preserve the creature by promoting exploration and vigilant attention to the wild creature's environment, as quoted by Mowrer,[1] is also primary and largely unlearned. In so far as such curiosity is learned it is probably acquired very early in the creature's life by imitation of the parents. This possibility itself poses a question as to whether the urge to imitate one's own kind is also a primary drive.

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[1] Mowrer, O. H., *Learning Theory and the Symbolic Processes* (pp. 189-192) (John Wiley & Sons, New York, 1960)

In school learning the pupil is rarely motivated by simple physical 'avoidance needs' such as pain or hunger, but he may often be driven by derived needs such as anxiety, fear and respect (a very healthy respect in relation to strict disciplinarians of the old school). He is impelled also by an urge to master a situation (derived anxiety or aggression) or an ambition to succeed. As the reader will well know, an even more effective motive for learning is curiosity and interest in the material being studied. It is difficult to say when the more primitive motivation shades off into the more mature and sophisticated purposiveness of classroom learning, but at some stage anxiety, aggression, respect and curiosity develop into ambition, a desire to please and higher level interest in the subject matter being learned.

These drives which have clearly a largely learned element are called *secondary drives* and account for the greater part of the urge to learn in humans. As stated in Chapter II, Section (iv), the learning of such secondary drives as fear, hope, anxiety, non-physical aggressiveness and respect for one's fellows and society, seems to be by the process of classical conditioning where the non-essential accompaniments to situations producing injury and pain, or relieving hunger or thirst become signs for these events. Thus the dentist's chair and even his waiting room tend to arouse anxiety in the patient. Similarly, if a pupil's difficulties in arithmetic are attended by outbursts of unpleasantness from his teacher, the arithmetic becomes a sign for anxiety and avoidance feelings. On the other hand, if the learning situation is successful or is attended by pleasantness and sympathy when producing difficulties for the learner, then arithmetic promotes hope and anticipation.

(iii) *The Urge to Learn*

Let us now look at the urge to learn which seems to characterise most humans and to be over and above the avoidance drives, whether primary or secondary, just discussed. This urge may be called intellectual, knowledge seeking curiosity.

Berlyne[1] calls it epistemic curiosity. Such curiosity is an important source for motivating school learning. Crude object-curiosity, shown in humans in the urge to look at horrible and bizarre objects and happenings, may have its roots in primary survival-curiosity and intellectual curiosity emerges from object curiosity, but it would be putting a wholly unrealistic bias on our interpretation of intellectual curiosity if we saw it as something negative. Work at Birmingham,[2] has shown that intellectual curiosity relates very closely to the quality of the pupil's thinking and learning and that curiosity promotes and is promoted by progress in learning.

Intellectual curiosity is aroused whenever the learner is in a situation which departs from what he expects and for which he has no repertoire of existing responses. Such features of the learning situation as novelty, complexity, unconformity and ambiguity challenge the learner. Anything which makes for dissonance or imbalance in his cognition evokes his intellectual curiosity. Thinking is what is called into play when the learner is in a situation for which he has no ready-made responses and concepts. Intellectual curiosity prods him on to think and to attempt to solve the problem situation. This he does by seeking for explanations and analogies. Ashton (*op. cit.*) found that high-level intellectual curiosity correlates very significantly with the tendency to put up possible hypotheses as explanations.

In his system of cognition Piaget deals with motivation by assuming that in every learner there is an urge to come to intellectual terms with his environment. This he calls equilibration.[3] In the challenging problem situations in which the learner is involved there is a discrepancy between the new situation and the old. Also the learner himself wants to be at one with his environment. Hence he seeks to equilibrate himself by assimilating the new features to those he knows and by accommodating himself to the new (see Chapter III, Section (ii)).

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[1] Berlyne, D. E., 'A theory of human curiosity', *Brit. J. Psychol.*, 1954, *45*, 180-191.

[2] Peel, E. A., 'Curiosity and interest in motivating school learning', *Proc. of XIV International Congress of Applied Psychology, Copenhagen*, 1961.

Ashton, P. M. E., 'A study of the curiosity of ten and eleven year old children', *Unpublished Ph.D. research, University of Birmingham School of Education*, 1965.

[3] Inhelder, B. and Piaget, J., *The Growth of Logical Thinking* (Routledge & Kegan Paul, London, 1958)

See also Ripple, R. E. and Rockcastle, V. N. (Eds.) *Piaget Rediscovered* (Cornell, 1964)

The works of Suchman and Crutchfield, mentioned in Chapter III, Section (viii) are instances whereby the learner's urge to come to intellectual terms with his problems are challenged by presenting difficulties and contradictions and by using them as didactic means to teach the child to think.

We may conclude by making two remarks about the purposiveness of learning outlined so far. First, much of the motivation mentioned is by avoidance of unpleasantness. This account of a predominantly negative purposiveness of classroom learning may seem a little thin when we think of the positive feeling that appears to permeate the normal present day classroom situation. This is based on curiosity and interest in the subject matter and the desire to master the material. These are what we must try to develop.

Secondly, the teacher must note that in the main the child learns when he wants to. Most children do want to learn, but it is important to bear the inverse in mind when we turn to the school failures, the maladjusted, retarded, truant and apathetic. Their behaviour is learned and the purpose it serves is to avoid a classroom situation that has become intolerable to them. Innate dullness in the pupil, lazy, uninterested and unsympathetic teaching or a wrong attitude or insecurity in the pupil may be contributory factors in the first place. Thereafter failure in the pupil's work is enough to continue the motivation of the wrong learning implied in maladjustment.

The young teacher is, therefore, well advised to pay some attention to the question of making school learning intellectually challenging and positively purposive.

(iv) *The Palpable Consequences of Learning*

(*a*) *After-effects*

The reinforcing state of affairs when a person is responding to a stimulating situation can be schematised as in Fig. 22 overleaf.

The pupil responds (R) to the question put by the teacher (S_I) by virtue of his interest in the situation and the urge to learn (S_D), and the teacher himself provides the after-effects in·the comments (S_A) he requires to make to the pupil's response.

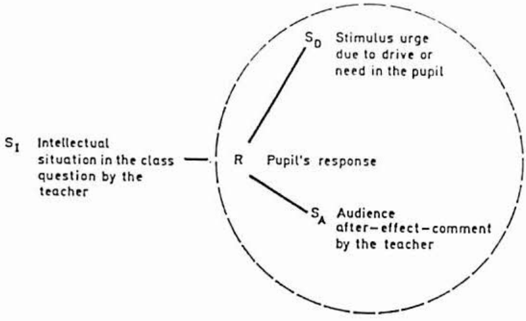
S_D Stimulus urge due to drive or need in the pupil
S_I Intellectual situation in the class question by the teacher
R Pupil's response
S_A Audience after–effect–comment by the teacher

FIG. 22

That is, he confirms it, or corrects it as necessary. This last constitutes the after-effects of the learning situation and that part of the whole schematised learning situation enclosed in the dotted line represents the motivation of the learning.

Thorndike,[1] quoted by McGeoch and Irion,[2] summarised the function of the part of the learning situation immediately following the learner's response as follows :

> Acts followed by a state of affairs which the individual does not avoid, and which he often tries to preserve or attain, are selected and fixated, while acts followed by states of affairs which the individual avoids or attempts to change are eliminated.

This formula would include not only the cases where noxious stimuli are avoided or reduced, as when we learn to respond in such a way as to reduce injury, and when a physiological drive is reduced, as in satisfying hunger, but also when we enhance positive pleasurable feelings, as when we carry out successfully some school learning or games performance.

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[1] Thorndike, E. L., *Human Learning* (Cornell University, 1931)

[2] McGeoch, J. A. and Irion, A. L., *The Psychology of Human Learning* (Longmans Green, New York, 1956)

Technically we describe S_A—the action of the audience or the experimenter—as the *reward.*

Three questions are prompted about the conditions making for the efficiency of the reward in shaping the learning.

First as to the amount of reward, experiments with animals show that when reward is given, say, in the form of small quantities of food after each trial, the effectiveness of learning is proportional, up to the point of satiation, to the amount of food given. But it does not work so with humans. Experiments conducted with school pupils show that they are not greatly influenced by cash awards—what is definitely important is a confirming or correcting response from their teacher (S_A—right or wrong).

Next there is the effect of frequency of reinforcement. As we showed in Chapter II, Section (viii)(*a*), effectiveness of learning varies as the frequency of rewarding situations.

Lastly there is the effect of delay in providing reinforcement and revealing the palpable consequences of the pupil's response. With animals and young children the effectiveness of the reward falls off rapidly if there is a delay exceeding a few seconds.

The concept of reinforcement and its fall off in relation to delay has important implications for the early training of children. When children are very young they demand immediate ' need reduction ' in a vehement way. Thus we have all seen the smart pupil who brings up his exercise book for marking and anticipating the immediate praise.

Even later, when the demands for need reduction are not so overt and explosive, the teacher should not develop the tendency to delay recognition or fail to give immediate credit or punishment when it is due. Homework should be marked promptly and mistakes in classwork corrected punctiliously. Oral answers in class should be given immediate reinforcement and not brushed aside as often occurs in inexperienced teaching. Any sceptic of the power of reinforcement can enlighten himself by setting tasks in class or for homework and failing to correct them. The results of the absence of reinforcement soon become very clear.

Similarly, in college students we find a real demand for terminal examinations as a means of reinforcing the term's learning. No student likes to cover too much ground in lectures without some check on his aims and progress.

With older learners the gradient of falling-off is not so steep and, in fact, there are many human learning situations where the rewards occur minutes, hours, days and even years later.

(*b*) *Secondary Reinforcement*

To account for learning situations where longer intervals of time separate the reinforced response and the reinforcing need reduction, we have the theory of *secondary reinforcement*. As McGeoch and Irion (*op. cit.*, p. 241) put it :

> A stimulus which, in the past, has consistently occurred in temporal contiguity with a primary reinforcement may also become a satisfier.

Any S-R connection which has been reinforced *acquires itself the power to reinforce any other contiguous or immediately antecedent S-R connection.*

Supposing a child has learned how to carry out simple addition of arithmetical fractions like : $\frac{3}{8}+\frac{5}{24}=\frac{7}{12}$; he has previously learned the sequence of the steps required to carry out such additions. The sequence may be as follows :

	Stimulus	*Response*
Beginning of Sequence	$\frac{3}{8}+\frac{5}{24}$	Find the L.C.M.
	Find L.C.M.	24
	Reduce fractions to the same denominator	8 into 24 goes 3 times, $3\times3=9$
	$\frac{9}{24}+\frac{5}{24}$	Add 9 and 5
	14	$\frac{14}{24}$
	Simplify	Cancel by 2
End of Sequence	$\frac{14}{24}$	$=\frac{7}{12}$

Each response becomes the next stimulus in the chain of events beginning with $\frac{3}{8}+\frac{5}{24}$ and ending with the final response $\frac{7}{12}$. This last is the one which draws the reward of approval from the teacher and the motivation is extended backwards by the child's learned knowledge of each next step in the sequence. The knowledge of each of these steps motivates the one immediately preceding it. Thus the response of finding the L.C.M. $(= 24)$ is motivated by the need to have it to carry out the reduction of the fraction to a common denominator.

Young children rarely see through to the end of a simple calculation. They are motivated by a previous knowledge of intermediate operations. The reader may notice the similarity with Gagné's hierarchy of learning sets (Chapter III, Section (vi)). He is concerned with the intellectual and conceptual aspect of such sequences, whereas here I am concerned with their motivation.

In more mature learning we often carry on a long task like preparing for a degree by being motivated only by steps immediately in front of us, such as writing this essay, carrying out this set of laboratory experiments, or attending this course of lectures. In this way we build up to the final examinations, without worrying about them until they come, because we have, in fact, been adequately motivated in the course of reaching this stage.

(*c*) *Reward and Punishment*

I am using these words in their broadest sense to indicate respectively the after-effects produced to reinforce desired learned responses and to obliterate undesired responses.

It is generally agreed, both among psychologists and educationalists, that it is more desirable to manipulate a learning situation so that the learner's response leads to a reward rather than to a punishment. There is no virtue in failing and in the linear form of programmed learning, to be outlined in the next chapter, the whole purpose of the programme is to avoid failing responses and hence punishment in the sense defined above. Although there is this feeling about the undesirability of punishment, there is not much research to support the view. One exception is the work carried out many years ago by Thorndike (*op. cit.*, p. 32) and reported by McGeoch and Irion (*op. cit.*, p. 261) where Thorndike had his subjects learn the English equivalent of Spanish words by using a multiple choice technique. That is, each Spanish word was followed by five alternatives in English and the learners had to arrive at the correct one out of the five. Here we had one correct and four wrongs. Even after correcting the greater chance of obtaining the right, Thorndike found that the wrong responses did little to help the general learning. In fact, a wrong response, merely by its occurrence, tends to be reinforced to some extent, and as McGeoch and Irion say,

> Indeed, Thorndike concludes that a response gains more in strength from occurring than it loses from being followed by the word ‘ wrong ’.

The right reinforcement pinpoints one response. The wrong merely indicates four alternatives and unless accompanied by information it can lead to less positive progress in subsequent learning. In other settings, punishment, in the form of painful experience, can be effective, as for instance when a child touches a hot object. The inconsistency seems to originate in the varied meanings attached to the word ‘ punishment ’. If we take for instance the example of touching a hot kettle, and the example of a boy being thrashed by a schoolmaster, we can see very readily how in the first place the punishment could be effective, whereas in the second the punishment might not lead to improvement in school work. The reason is that in the first the painful reinforcement ties directly to the response being made and the child learns to avoid hot objects. In the second case the direct result would be that the pupil would learn to avoid irate schoolmasters and this need not necessarily bring about an improvement of school work. It is our business as schoolteachers to see to it that the punishment we administer (I am again using the word in its broadest sense) should be relevant to the response we desire to bring about.

Punishment in its broadest sense then can mean at least three things. First, painful stimulation and here the giver of the punishment must be very careful about its relevance. Secondly, frustration or delay of reinforcement, or making the task more difficult and requiring more effort. Thirdly punishment can give information, as in the reinforcement ' wrong ' followed by an explanation of why it is wrong.

In the school situation the third type of punishment is much more prevalent and useful. All three, however, overlap to some extent. An electric shock gives information.

Punishment may, in addition to weakening wrong responses, raise the level of motivation, provided it is again commensurate with the whole learning situation. Too much punishment may also lower the motivational level. Punishment may also raise the sensitivity of the learner to the stimulus side of the learning situation and it may, of course, also compel him to look elsewhere for a response. All these are valuable results of the typically mild type of verbal punishment exercised most widely in the school situation.

However, we must again repeat that punishment is not a real substitute for reward. If the learning situation can be so manœuvred that a right response is obtained, then this is likely to lead to better learning in the long run. By avoiding punishable responses, one avoids also not only the reinforcing of the wrong response mentioned by Thorndike, but also the traumatic consequences which may lead the learner to avoid elements in the learning situation altogether.

(*d*) *Feedback of Information*

From what has been said in the above section, it is clear that in the school situation punishment must involve the idea of feeding back information to the learner. It is no good, after studying an essay, merely, if it is bad, to give it a low mark. What the pupil needs to know is also why and how it is bad. It may also be necessary, in the oral part of a lesson, when the teacher is asking for replies and receives wrong ones, for him not merely to brush aside all the wrong answers, but to take up one or two and show why they are wrong before proceeding to the correct answers.

McGeoch and Irion report (*op. cit.*, p. 267) the results of a little experiment on the effect of adding information to the correction given when students undertook a very simple learning task. The students were required to draw a three-inch line and their errors were measured to the nearest $\frac{1}{8}$ inch. Each subject was given 100 trials and in the following table the trials are divided into three sets: the first 30, the second 40 and the last 30, and the entries in the table refer to the average errors obtained in each of these sets of trials in terms of $\frac{1}{8}$ inch. The experimenter divided his students into four groups: a control group who had no reinforcement at all—the experimenter said nothing after the drawing of each line; a nonsense syllable experimental group in which the experimenter spoke a different nonsense syllable when the subject had finished drawing each line (this must have been a nightmare or Lewis Carroll situation); thirdly a group in which the student was informed simply whether the drawing was right or wrong; and fourthly an exact information condition in which the subject was told the amount and the direction of his error.

TABLE 6

Improvement after Practice
Average errors in $\frac{1}{8}$ in.

Subjects	Control	N.S.S.	R-W	Exact Information
1st 30	5·97	8·87	7·33	1·93
2nd 40	6·85	8·57	5·35	1·12
3rd 30	6·40	8·43	3·90	·97

Percentage of Correct Drawings

Control	13·6
N.S.S.	5·1
R-W	22·6
Exact information	54·8

The results speak for themselves, but any student who has had any experience of schoolteaching at all does not really need such an experiment to convince him of the incomparable value of providing a feedback of information when work is wrong or could be improved.

The human learner does not require physical punishment and does not like emotional, abusive, sarcastic or verbal punishment. He is sufficiently involved in his tasks to be completely motivated by a feedback of information when things have not gone as right as they should. Lastly, we should hardly need to remind ourselves also that this information should be given as promptly as possible.

In his role as a reinforcer of learning, the teacher then seems to have two functions.

First he needs to maintain authority in general as the leader of a group and the leader of the classroom group must be the teacher. He must not be over-excessive or over-personal in his punishment and in his praise and blame, since this would lead to the reinforcing of a response to himself rather than to the subject matter. None the less, he needs to maintain the position of general authority.

Secondly he must correct work so that he brings about a love of the subject. The reinforcement must be to improve the learning in the subject matter and for this to happen the teacher's reinforcements should be as informative as possible.

(v) *Performance and Standards*

A man takes up gardening and at first follows the instructions of his more expert neighbours, without perhaps a great deal of insight. The motivation is of a simple kind, the need of his wife's approval, a desire for vegetables and flowers, or for prestige in the eyes of his neighbours. At a later stage he begins to take joy in gardening for its own sake. He varies his methods and is less concerned with pleasing other people. He sees gardening as an activity demanding expert knowledge and application. Here we have a second kind of motivation. But the enthusiastic gardener does not stop here. He attempts to improve his results. He sets himself new standards, partly acquired from fellow-gardeners. He takes up the challenge of growing plants which are more difficult to grow.

When a learner is making progress and seriously committed to the task in hand he looks forward to future learning sessions by at least implicitly setting himself fresh standards at which to aim. The relationship between his immediate past actual performance in the skill, whether of the classroom or of the games field, and the standard he is trying to reach may provide us with insight into the extent to which the learner is really motivated in his task. A realistic relationship between performance and standards indicates genuine motivation whereas an unrealistic standard, too high or too low, indicates that the learner is no longer involved.

Here as in so many other cases William James has described in his characteristic way precisely what we, half a century later, are now trying to express in terms of modern theories.

> ' So we have the paradox of a man shamed to death because he is the second pugilist . . . in the world. That he is able to beat the whole population of the globe minus one is nothing : he has " pitted " himself to beat that one. . . . Yonder puny fellow, however, whom everyone can beat suffers no chagrin about it, for he has long ago abandoned the attempt to " carry that line ", as the merchants say, of self at all. With no attempt there can be no failure, with no failure, no humiliation.'

James saw the problem as a conflict of the different selves that a man is capable of entertaining. The view of James brings out very clearly how important it is to find some area of learning which yields success to the learner. Success in one area compensates for failure in others. From this statement it also follows that it is useless to accuse a child of failure if he has not tried. Many of us err by judging children's ' failures ' by our own frames of reference. Insensibility on the part of the teacher towards the involvement or non-involvement of a child in a task may lead to much wasted effort in the classroom.

(vi) *Level of Aspiration*

Lewin revived our interest in this aspect of motivation by his concept of *level of aspiration*. When a person is actively involved in a task he sets himself a new standard to conquer—this is called the level of aspiration. He may raise the level if he has just succeeded, or he may lower it if he has just met failure. The important point to note is that by the concept of the level of aspiration we account for much human learning which is left unexplained by the law of effect. We do not tend merely to repeat successful responses. On the contrary, we take risks of future defeat by challenging our capacities by raising the level of our aspiration. We do not reward responses but persons who will act according to what is likely to bring success in the future. The mere repetition of successful responses is shown only in non-involved behaviour, as in the finger movements in typewriting (very necessary) and in 'pot-boiling'. One measure of a writer's or painter's interest in his art is his refusal to turn out long series of material according to a set 'successful' formula.

The circumstances governing the change of level of aspiration in simple learning situations have been investigated by

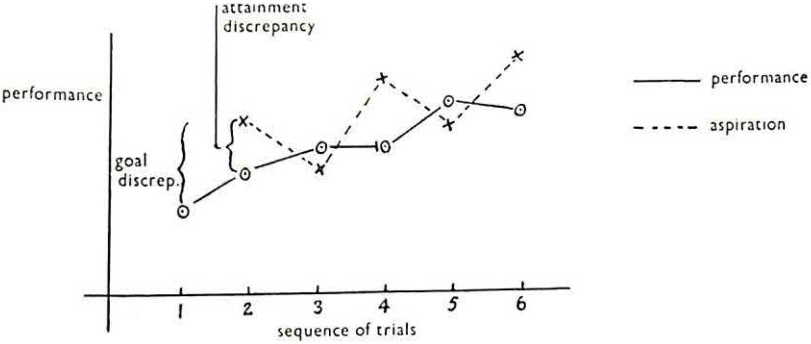
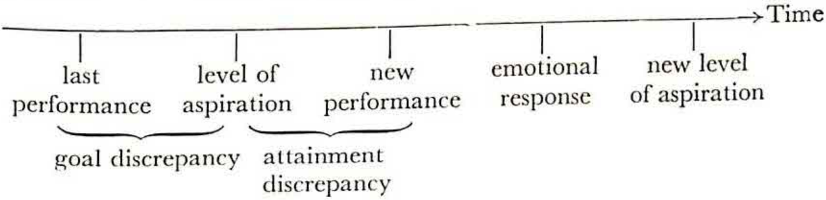


FIG. 23

several workers. In experiments on the speed of setting type or the accuracy of hitting a target the level of aspiration is defined as the level of performance which an individual explicitly undertakes to reach. So we might have the graph of aspiration and performance in Fig. 23. In the whole situation there are the following factors: the past performance, setting of the level of aspiration, new action, feeling of success or failure at the level of attainment reached, future action, setting a new level or 'leaving the field'. We may represent these elements on a time scale as follows:



A positive goal discrepancy means that the level of aspiration is set *higher* than the *previous* performance (see Figure 23). A negative attainment discrepancy means that the new performance has fallen short of the level of aspiration.

Broadly speaking there are two sets of factors which determine the level of aspiration. First there are the personal factors. These may be associated with the immediate situation and experience of the learner. Previous failure in a series generally leads to a lowering of the level of aspiration, previous success to a raising of the level. There is evidence also of transfer of failure feelings associated with one series to a new series. Of course, these laws only operate within the range of performance that the individual feels capable of doing. In England Himmelweit endeavoured to show that the tendency to raise, lower or maintain an unchanged level of aspiration is associated with normal and abnormal personality states. Few clear-cut differences emerged, but normal women appeared to be more flexible than normal men, and hysteric psychotics had a lower level of aspiration than normal persons.

The second set of factors are cultural and environmental. The average standard of one's own group or class will affect the individual level of aspiration. Thus the 'bright' child in a class may tend to set himself a lower level than his performance while the dull child will set himself a higher level (subject to his remaining in the field). On the other hand, the standards of other groups may affect an individual's level according to the prestige of the group. Thus if we know the level of performance of a group of experts we tend to raise our own level considerably, whereas if we are told the scores of a group of learners we tend not to set our level so high. This demonstrates the power of prestige in setting learning standards.

An interesting experiment on college undergraduates was carried out by Festinger.[1] Three pairs of equivalent groups were chosen, one pair being told either that their performance exceeded or fell short of the performance of high school pupils, another pair that their performance exceeded or fell short of general undergraduate performance, and the last pair that their performance exceeded or fell short of graduate performance. Each of the six groups then gave its level of aspiration. The results are given as goal discrepancies in Figure 24.

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[1] Festinger, L., 'Wish Expectation and Group Standards as Factors influencing Level of Aspiration', *J. Abn. Soc. Psy.*, 1942, *37*, pp. 184-200.

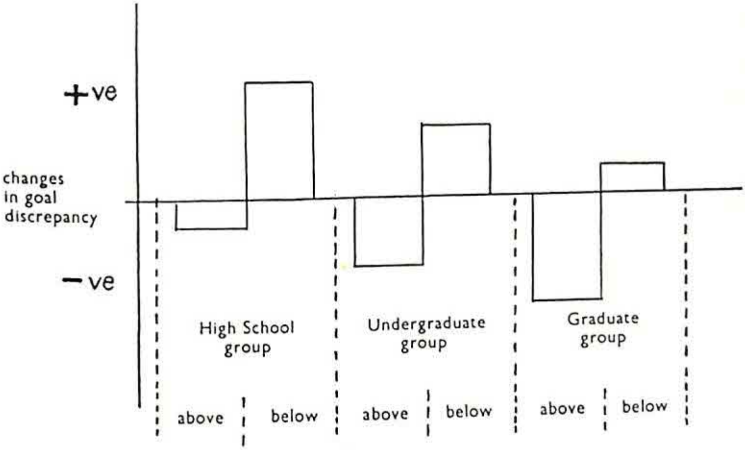

FIG. 24

Thus when an undergraduate student is told that his performance is *below* the performance of a high school pupil he raises his level of aspiration considerably, but when he is told that his performance is *above* that of a high school pupil he drops it only to a small extent.

Habitual success or failure in school has an effect on level of aspiration, and in American studies the level of aspiration is higher in those students coming from poorer socio-economic backgrounds. This is also true in many instances in this country, but it neglects the incentive offered by the subject of study itself.

There has been one notable research on the level of aspiration in simple school learning (Sears) and the effects of success and failure. The results are generally in agreement with the findings discussed in this section.

Obviously much depends on the teacher, the group standards and the constitution of the class, and the immediate and habitual experience of the child. Within limits, success and frustration bring about involved behaviour. The goal discrepancy scores and marks of involved children are higher than those af children who are not involved. Success leads to a raising of the level of aspiration and hence in general to further success and improved levels of performance. Failure may lead realistically to a decrease in the level of aspiration and subsequently to increased insight into the learning, but if the failure is excessive then the child may ' leave the field ', that is, drop the level of aspiration to zero. The *feeling* of success or failure can only be experienced by those who are involved. The child comes to know by experience and ' by example and precept of prestigeful persons what are valued activities. These values incorporated in the ego, become reference points for self judgments of success or failure ' (Sherif and Cantril). The child who is not involved can experience neither success nor failure.

(vii) *Reading List*

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(viii) *Exercises*

1. Observe a child at play and note any evidence of change in level of aspiration. Note also the rapid fall in level of aspiration as the child becomes tired.

2. Obtain an unusual article (from a museum or collection if necessary). Place it before children and note evidence of their curiosity. Attempt to stimulate this curiosity by telling them a *little* about the object.

CHAPTER VI

SOME FURTHER LEARNING TOPICS

(i) *Memorisation* (ii) *Attention* (iii) *Discipline* (iv) *Remedial teaching* (v) *Programmed learning* (vi) *Reading list* (vii) *Exercises*

(i) *Memorisation*

THE method by which a child commits material to memory seems simple, but on looking into it more carefully it is clear that several things are involved. First there is the *memory span* for simple units like letters, numbers, shapes, symbols or nonsense syllables. The span of rote memory is inborn but it can be extended by learning techniques. These depend upon the fact that the learner can *give* meaning to anything before him. It is a matter of manufacturing associations in accordance with the principles of association and gestalt psychology. Individuals also vary in their innate capacity to grasp *relations* between different stimuli, but this quality can be improved by learning devices.

Associated with these individual qualities are certain processes which enter into the act of memorising. First we are able to *record* the material to be learned. Here we are concerned with the place of repetition, association and economy in learning. Secondly, we *retain* material over varying intervals of time. Here we are concerned with remembering, inhibition and forgetting. Lastly, we are able to reproduce the memorised material, and at this stage we must inquire into the *recall* and *recognition* of learned matter.

What significance has learning theory for these stages in the process of memorisation?

The limit of purely rote memory in any child may be set by something in the brain physiology. It may be akin to Hull's reactive inhibition. Experiments on the memorisation of lists of letters, numbers and nonsense syllables show that, whilst he may increase his memory span by rote repetition, as outlined in Chapter II, Section (vi), the learner soon becomes very active in his search for meaningful associations. By these he combines sequences of numbers, letters, and syllables into single units. Thus he assembles number sequences in terms af telephone numbers, physical constants, arithmetical groupings, and letters in terms of initial letters, significant syllabic groupings, or even car registration letters. The meaning of these associations is often not apparent to the outsider for they arise in the mind of the learner. If a sequence of words is presented, say.

pan, chief, wind, sea, boy, car,

the learner actively links each by his own associations.[1] These simple experiments show how effective the laws of association and stimulus-response theory can be in explaining the facts of memorisation. The facts of span, fatigue, disuse, atrophy, the importance of rest and a pause, the need for spaced repetition, that is, repetition at regular intervals, which gradually increase in length of time, all support a multiple theory of forgetting.

But even in the case of simple memorisation, stimulus-response and association theories cannot offer completely adequate explanations. The learner is active in his search for combinations which are meaningful to him. Here we see the possibilities of the theories of gestalt psychology. The learner grasps at combinations of numbers and letters, rhythms, meaningful blocks—he is also active in his search to unite the parts into a whole. This he tries to achieve by the 'best' manner possible to him. Here we see at work the law of the good gestalt. Thus each reader may make use of a different 'good' gestalt when asked to memorise the pattern of letters :

A C H
S T P
I M B

---

[1] Word association tests were devised by Galton and are used by the psychoanalyst who asks for a response from the person tested.

word called	*response*
black	white
cart	wheel
boy	etc.

The psycho-analyst has to interpret associations that may appear to be unconscious or even meaningless to the outsider.

A few will learn this pattern by rote, some by spatial relations, others by logical connection or meaningful association, and most by a combination of all, producing for each individual the ' best ' form.

When we turn to the memorisation of meaningful material such as a connected piece of prose or poetry, the applications of gestalt principles are greater still. Thus when memorising a passage we note its general sense and the place of each part in the general scheme. We note punctuation, structure of sentence and use of words. The passage as a whole, even when over-learned, is not uniformly present in experience. Some words have stronger significance than others. Proper names, place names, words carrying rich imagery and associations, all these may stand out so that the passage is really like a distant landscape connected by certain clear-cut features and objects. The active interest aroused by a passage also gives rise to further progress and higher standards of memorisation.

The excessive use of mechanical rhythms in a meaningful passage can undo a real insight into it and its memorisation. This is seen very clearly in the case of passages which are sung, like hymns and psalms. The choir boys' attention is mainly focused on the tune, rhyme and rhythm and consequently the words may have only a tonal and rhythmic value. We may be in the habit of singing a hymn for many years and not realise the meaning of what we sing. I remember

> There is a green hill far away
> Without a city wall . . .

Only in my adult years did I question what ' without a city wall ' meant—and that after I had spent some years in Scotland where the word ' without ' is used much more frequently than in England to mean outside. This tendency is aided by the fact that often rhyme and rhythm tend to break up the meaning, since they may emphasise meaningless breaks at the end of lines.

After studying a passage generally, we then turn to *active recitation.* Alternation of reading, recitation, reading, recitation is recommended. The learning must be *active* for actively learned products are better retained.

A question often discussed is the value of 'whole versus part' recitation. Psychological evidence is not unanimous but there is more in favour of whole learning. It depends partly on the length of the passage. Part learning makes for maintaining immediate interest. Whole learning makes for correct meaning, since false and incomplete associations are avoided by taking the whole passage at a time. The best method seems to be to combine both, such as in the following scheme in which recitation alternates with reading.

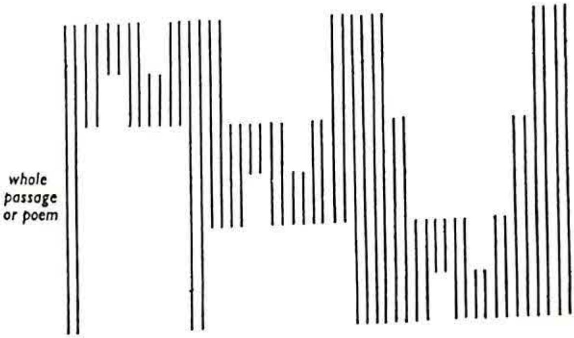

FIG. 25

We may summarise as follows :

Observant, intelligent and active study of the material as a whole in a search for prominent patterns, cues and relationships forms the basis of good memorising. Furthermore, learned material should be applied as soon as possible, but not until it has been memorised correctly.

Our discussion has been mainly concerned with the recording and retention (through our study of fatigue and forgetting) of material to be memorised. The end processes consist of recall or recognition. Both these phases are helped if the associations utilised in recording have been varied. As is well known, recall is harder than recognition. In order to recall we can only avail ourselves of a few cues—as when we recall a name or piece of information in connection with our studies. When we recognise a person or material object we have many more cues and associations to make use of. The efficient learner tries to make each act of recall an act of recognition by enriching the associations when recording the material.

(ii) *Attention*

One of the teacher's chief tasks is to catch and sustain the attention of his pupils. Attention is a condition of learning. We might also say with Woodworth, 'Attention explores, perception discovers'.

What are the facts about attention, about the attending pupil?

In the first place he is not passive, for the attentive response is active and searching. The eye and the mind are not fixed, but on the other hand neither are the eye movements and mental attempts at solution haphazard. There is purpose in the attentive set: the movements are exploratory, as in the examination of a passage of prose, of an engine, or a map.

The fluctuation of attention in perception that we experience when we fix on a small spot on a white surface and the fluctuation we are aware of when we study a problem, have an explanation parallel with the theory of reactive inhibition. Fluctuation is caused by sensory and mental fatigue and has its beginnings in physiological roots.

The ways by which attention can be aroused may be viewed as special cases of stimulus-noticeability. For example, *change* stimulates attention. Those who use a microscope know the value of moving the slide when attention is roving, and the effectiveness of the flashing neon advertisements is known to all. Negatively, there is the monotony of a constant stimulus: the nagging, repetitive teacher—one can tell a class something too many times. On the other hand *repetition*, provided it is not overdone, leads to increased attention, as the salesman, the advertiser, propagandist and demagogue know. The rhythm in artistic design, whatever the art form, helps to stimulate the appreciation. Similarly, suitably spaced repetition is beneficial in a lesson or series of lessons. The *strength* of the stimulus also makes for attention; this is something that artist, poet, writer and musician make use of. Bright colours, clear allusion and descriptions, are all used when the artist wishes to focus attention. Similarly *definite forms* make for increased attention —concrete illustration, careful use of diagrams and emphasis in the lesson. There the gestalt theorists have something to offer.

The attention of the learner is also better aroused if we appeal to his habitual or temporary interests. These interests themselves are partly determined by the society in which he lives. *Social influences* tend to standardise what we attend to, as in the case of interests and attention aroused by the popular press. That part of his interest which is personal is best explained in terms of the *active* learner, but much of the socially determined interest is best examined in the light of *conditioning*.

The teacher is often more concerned with sustaining the child's attention over a long period. There are three stages in this sustenance of attention that are well known to the teacher. All may be accounted for in terms of the learning theories discussed, particularly the theories which make the most of motivation and self-activity on the part of the learner.

(*a*) In the first place attention is stimulated by interest, curiosity and wonder. So we see the child who takes up fretwork as a hobby or swimming as a recreation, or the adult who takes up painting as a pastime. In all three cases the person soon reaches a stage when interest and curiosity are not enough. Similarly when we read a novel we should be stimulated in the early pages and if not, we press on for something definite. The same is true of serious reading. This is shown very often in higher degree theses in Education. Thesis writers often fail to realise that examiners, like ordinary readers, need to have their interest and attention stimulated. Many writers fail to give a definite statement of their problem.

This first stage of attention defines the subject matter to be worked at or studied. All school work should start from this point and even where a long series of lessons is necessary in one subject, as in arithmetic, in each fresh lesson the children should be re-stimulated. Each lesson should offer some opportunity for exploration.

(*b*) For most school subjects, covering a long period of time, the final objective might be lost sight of. The work may be too difficult or too time-consuming. How many of us have started on a new enthusiasm only to drop it after the shine has worn off. In order to carry on we must pass into a second stage when the continued interest has to be supplemented by more disciplined study. At this stage the incentive may be extraneous to the activity concerned. It may take the form of a challenge to the self-assertion or powers of the individual. The incentive may have to be supplied by the teacher. For example, there may be little attraction in learning to read, after the first period of exploration has been passed. The child learns to read because he has to. The motive may be fear, discipline, social prestige, need to attract the teacher, need to shine in class or even to earn rewards from parents or teachers.

(*c*) At the third stage spontaneous attention again appears, for by now the learner has achieved mastery of his material, whether in hobbies, play or school studies.

The first and last stages are spontaneous and involuntary. The teacher's main task is with the middle ' willed ' stage. He should use all devices in his power to lead children through this phase. He should, however, also see that each lesson is itself a complete cycle of the three phases.

How does motivation fit in with these recognisable phases in sustained attention?

The concept of drive, of the urge to learn and the law of effect have something to offer in connection with the initial stimulation of attention. Failure in the activity and the subsequent tendency to leave it are also another form of obliteration of responses.

In so far as the second stage requires the teacher to supply extraneous motives, rewards and punishments, we get the best account from reinforcement theory. But the child also supplies his own motives, closely connected with self-feeling and the standards which he sets himself. The psychology of the self and the concept of level of aspiration are relevant here. As the child masters processes he looks forward to harder fields. Lastly, disciplined study brings with it genuine insight into the processes culminating in the third phase of joy in mastery and application.

The facts about distraction also lend support to the theories of learning.

First of all, attention is selective. We can attend only to one thing at a time, unless one activity has been trained and relegated to the reflex level. The two can then go on together. Another way of doing two things at once is first to attend to one and then to the other, or to combine the two operations into a single larger unit, as in piano playing or writing an essay or letter. Clearly these are examples of gestalt principles.

Some people find it an aid to concentration to harness some simple physical activity, such as pacing the room, or heightened physical tension, such as sitting upright, to their mental work. In some factories music accompanies tedious routine operations with an increase in efficiency. It is harnessed to the tedious, repetitive factory tasks.

Allowing that attention is very selective, it is easy to see how distracting influences may interfere. Competing interests, competing stimuli and mental fatigue all decrease attention. We may make greater efforts at the task in hand. This is simply said, but what does it *mean*? Not that we should concentrate on *attention*. If we do this, we look at our self, and attention wanders even farther away from study. It really means that we must look closer and more intelligently at the material we are learning, trying to find new relations, trying new approaches to the subject matter, reading aloud, and varying the applications. At the same time we may try to cultivate the habit of inattention to or inhibition of the competing interests and stimuli. As we have seen in an earlier paragraph, it is possible in some circumstances to couple the distraction with the main object of attention. We may organise the distraction into attentive wholes.

(iii) *Discipline*

Like most abstract nouns the word ‘ discipline ’ has several shades of meaning. These include an almost Old Testament concept of ‘ just ’ retribution, discipline as class management, as training, and self-discipline as personal responsibility. The last named may also take both desirable and undesirable forms. The self discipline which is shown in the prefect system of our grammar schools and has grown out of the practice of self-government is a beneficial form. But in so far as self-discipline means atonement it may carry with it unhealthy implications.

We may dismiss the concept of retributive discipline as outside our discussion. It is more a topic of comparative religion and philosophy, but we can make some psychological comment in passing. This form of discipline is most evident when society is *in extremis*, when war is on, in concentration camps, and when religious or civil strife has appeared. An element of it enters into capital punishment. It is a primitive form of punishment and the persons who feel it to be necessary are often themselves immature. The absence of retributive action distinguishes the mature leaders of men, like Christ, Alfred and Gandhi, from the immature leaders like Napoleon and Hitler. As a method of punishment it is very contagious (see Bettelheim[1] on punishment in concentration camps) and leads to social disintegration.

In the classroom we are concerned with discipline in the sense of the last two meanings, *viz.*:

(*a*) Discipline as a means for training youngsters to lead an educationally acceptable and personally beneficial existence, the emphasis being on training by influences primarily external to the child.

So we train a child in correct writing habits and in accurate arithmetic by insisting that he rewrites the material, that he corrects his sums and carries out extensive drill work. In certain circumstances we may also need to show disapproval and anger as well as approval, particularly when neutral training is not yielding results. This has the effect of re-asserting the teacher's prestige in the eyes of the learner—a necessary condition in this simple learning.

(*b*) Soon, however, the child becomes less dependent on these external methods of discipline. He becomes an active participator with insight into what he is doing and

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[1] Sherif and Cantril, *The Psychology of Ego-Involvement*

> he no longer needs so much external probing and pushing. He becomes partly responsible for his deeds and he can perceive where repetition and correction are needed. He knows himself, learns what situations he should avoid and what activities he may join.

Clearly the first kind of discipline is most effective at the more primitive levels of training and can be very adequately explained in terms of *reinforcement*. It is a matter of rewards and punishment (N.F.E.R.) ; and research (Anderson *et al*) has shown that on the whole it is paradoxically better to discipline by *reward* (a positive goal) than by punishment.

When the child has reached the stage of perceiving that discipline is needed and actively participates in carrying it out, it is quite clear that we need more than reinforcement to explain what goes on. We must appeal to his insights and personal motivation. It should be our business as teachers to explain why correction is necessary, to bring about insight into the material being acquired. Then we should attempt to involve the pupil in this process of maintaining progress and striving for fresh standards. As we have seen, involvement is a necessary condition for changing the pupil's *levels of aspiration*.

Finally these standards become incorporated into the self, and so we have moral action. This stage is healthy only when the individual knows himself, his limitations and potentialities, and comes to terms with his morality. It is unhealthy when the discipline takes the form of morbid remorse for actions which are temporarily pushed out of the personality only to be taken up again when the guilt phase has passed. Like the immature person who enjoys inflicting retribution, this type of individual is also very primitive—lacking self-objectivity and enjoying self-retribution and self-punishment.

Since it is only the mature person who can be disciplined in the full sense, including not only conditioning by external influences, but also by active participation, we ought now to ask what should be done about disciplining maladjusted children. Mental health is a *condition* for normal discipline, so that children whose emotional development has been arrested as in the case of the maladjusted, many delinquents and some of the backward and retarded—are not in a fit condition for usual disciplinary treatment.

In the case of these children the first problem is their rehabilitation to normal life and restoration to mental health. The discipline practised should be mild, neutral and objective. Reinforcement by *rewards* rather than punishment should be the rule. It may be necessary to allow the child to 'work out' some of the centres of disturbance in his emotional system. Thus the excessively aggressive or fearful child may use play material, puppets, toys, to act out the cause of the emotional blockage. Often such children have had a surfeit of traditional school and parental discipline, and any further applications of similar methods only drives in the devil. Another cause of trouble may lie in the anxiety of the parents. They are fearful lest the child should let them down and saddle him with excessive responsibility.

Such therapeutic discipline is a long business but once the child has reached the stage when he makes a *normal* response to the training and learning of school and home, we can then turn to normal methods. More can then be made of the corporate life of the school, of the part the individual child plays in this life, and of his responsibilities and rights. In this way the highest forms of discipline may be achieved.

(iv) *Remedial Teaching*

The term 'remedial teaching' is usually associated with the teaching of children whose educational attainments have not come up to expectation on the basis of their intellectual powers. Since, however, all the principles of remedial teaching, in this restricted sense, also apply to the teaching and rehabilitation of the maladjusted, and also in many cases to the teaching of dull children, I shall refer in this section where appropriate to all three classes of child—the retarded, the maladjusted and the dull.

In a way retardation is a special case of maladjustment, since it refers to maladjustment to school subjects, whilst the broader concept refers to the child's reaction to anything that is in his environment. The causes of both conditions are complex, including inborn intelligence, the emotional climate and stability of the home, the maturity of the parents, the relations with the teacher, teaching methods, school conditions, the child's emotional make-up and his health—all, in fact, that nature and nurture have bequeathed to him.

It is not my purpose to give a detailed account of the principles of remedial teaching (this can be obtained elsewhere) but here are some of the things which should be borne in mind when special teaching is to be provided for retarded and maladjusted children.

As far as the lessons are concerned they should be as individual as possible, and consist of short, well-planned periods, each preceded by short intervals of quick oral and written drill. They should begin well below the level of the child's attainment, but once a confidence and willingness to learn has appeared they should progress in difficulty until the child sees in them a real challenge to his powers. High morale should be maintained. Wherever possible new methods and new materials should be used. Discussion should be held with the child on the immediate policy in the teaching and the reasons given for drill and repetition work. The long-term policy is, of course, a confidential matter for the teacher only. Records of the child's progress should be kept as well as details of all aspects of his nature and nurture. There should be a follow-up of the child after leaving the remedial class in order to prevent any retrogressive changes.

Remedial teachers should have a good personality, be kindly, imaginative and firm. They should be personally mature (see Chapter XIII), not liable to take offence in their interpersonal relations with their charges, and they must find something to *like* in each pupil they teach.

Can the discussion of learning in Chapters II, III, IV and V offer any guidance ? I think it can.

First, most teachers do not realise that, in order for his learning to stick, a child must *want* to learn. This failure is perhaps not unexpected since most children with most teachers do want to learn, but there are the few children who become retarded or maladjusted and who have some grounds for avoiding learning. These are often missed by the class teacher.

So in the remedial process the first emphasis is on finding a *need* which can be reduced by the particular activity (correct reading, writing and arithmetic) which it is desired to reinforce or learn. The first task is to make the child want to learn. Hence the need for a kind, affectionate teacher, capable of winning the child's confidence, the individual approach, easy lessons at first, short lessons, new methods and co-operation and active participation of the child.

Since it is in fact a problem of re-education of the emotions, it is largely a matter at first of unconditioning. Insight has played only a small part in these early aberrations. Has the reader noticed how the retardation, maladjustment, odd behaviour, fears and phobias of children in need of treatment often appear so meaningless? They have simply been badly conditioned. Unconditioning is a slow process, and the first requirement is to supply a fresh need to be satisfied.

Once the 'want' to learn has been re-established the next task is to reinforce the *correct* S-R bonds. Both stimulus and response may be generalised, leading to errors in the skills and attainments. Our task is so to present the required stimulus S that it is clearly connected with the desired response R. Hence it is essential to have short, well-prepared lessons and quick drill, making for exactness.

The dull child enters this scheme of things principally because the original situation consists of tasks which are too hard for him. The teacher in the infant and primary school may not be aware of this early enough. Hence the consequent maladjustment and retardation and hence also the need for *diagnosis*.

The insights of the child undergoing remedial treatment must also not be neglected. Tasks are simple at first to allow insight to develop. The teacher's main task is to structure the insights and to explain why certain tasks have to be undertaken. The teacher should grasp at any 'good' form and should exploit any special associations, interests and experiences the child has had. It is more necessary to do this in remedial teaching since the usual structures and 'good' forms inherent in the taught material may not be present. We have therefore to look for other forms in the child's experience.

Once the learner shows the first signs of genuine interest in his work, then is the time to regard the whole process of teaching as a means for involving him more and more in the task in hand. The human learner is active, and we encourage this activity by discussing his work with him, by careful grading of the tasks and then by challenging his newly re-awakened ' want ' to learn. The object is to get him engrossed in the task and thence to challenge his aspiration.

(v) *Programmed Learning*

Programmed learning is a system of self-instruction carried out by the learner with the aid of the programme which provides the learning situation, asks for the response of the learner and provides the feedback of information to reinforce the learning. It thus embodies many of the principles discussed in the previous chapters. Any learning sequence which is so arranged as to bring about progress in learning can be programmed, but two extreme types of programme were associated with the beginnings of work in this field. They are called the *linear* and *branching* sequences and here is an example of each, covering roughly the same topic and range of instruction, taken from a standard publication on programmed learning.[1]

(*a*) *Linear Sequences*

4. The Equator is an imaginary line that cuts the world in half as shown in the diagram. (*Diagram showing the Equator as a dotted line and naming it. Omitted.*)

Remember that the Equator is only an imaginary line ; it does not really exist on the ground.

5. The shape of the world is a sphere and it can be imagined to be cut in two by a line going right round it called the .... (Equator.)

6. The .... (Equator) is an imaginary line cutting the world into two halves, like this : (*Diagram showing a circle divided by a dotted line. Omitted.*)

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[1] Leith, G. O. M., Peel, E. A. and Curr, W., *A Handbook of Programmed Learning*. *Educ. Rev.*, Occasional Publications, No. 1, University of Birmingham School of Education, 1964

7. The two halves of the world are called the Northern Hemisphere and the Southern Hemis..... (hemisphere),

8. A ' hemisphere ' means ' Half a sphere '. The world is shaped like a ball or sphere, and the Equator divides it into two hemispheres. (*Diagram naming the two halves. Omitted.*)

9. A place North of the Equator is in the Northern Hemisphere. A place South of the Equator is in the S....... Hemisphere. (Southern.)

10. If a place is in the Northern Hemisphere, it must be North/South (YOU CHOOSE) of the Equator. (North.)

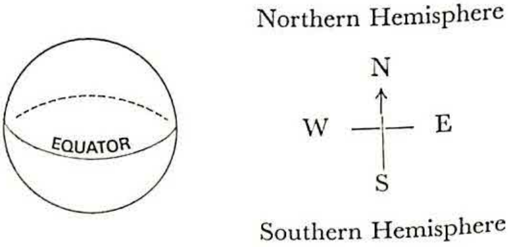
11. A place South of the Equator must be in the .... Hemisphere. (Southern.)

12. Everywhere North of the Equator will be in the .... (two words). (Northern Hemisphere.)

13. Everywhere South of the Equator will be in the .... (two words). (Southern Hemisphere.)

(*b*) *Branching Sequence*

The EQUATOR is an imaginary line that cuts the world in half, like this :



Remember that the Equator is only an *imaginary* line—it does not really exist on the ground so you could never go and have a look at it. You could, of course, stand on the Equator, or rather, the place where it would be if you *could* see it.

The Equator, by going right round the world, cuts it into two halves or HEMISPHERES, the *Northern Hemisphere* and the *Southern Hemisphere*.

A place North of the Equator is in the Northern Hemisphere and a place South of the Equator is, of course, in the Southern Hemisphere.

Question

The British Isles are North of the Equator, therefore, they are in the

(*a*) Northern Hemisphere .....

(*b*) Southern Hemisphere .....

If you choose (*a*), turn to Page .....

If you choose (*b*), turn to Page .....

Don't forget to write down your answer, numbering it with the number of *this page*.

Later research, however, has taken the idea of programming forward to combine the two basic approaches—that is to have a short passage or panel[1] followed by a linear sequence of questions and then to have another panel and so on. For the panel we may substitute practical work, diagrams, charts, tables. Even the questions may call for practical action. As Leith wrote (*op. cit.*, p. 97) :

> . . . programmers now feel free to depart from the prescriptions laid down by the pioneers ; the linear and branching styles are no longer regarded as rival models of programmed learning but find their place in a wider range of methods to be used when each is appropriate : activities other than reading and writing have been introduced into programme sequences ; and greater emphasis is placed on structural aspects of programmes.

We may, however, study the two basic prototypes to get a better view of the underlying principles of programmed learning.

(*a*) *Linear Programming*

As originated by Skinner, linear programming is straightforward three term contingency reinforcement (see Chapter II, Section (ix)). The three terms are : a stimulus situation, the question asked ; a response, the pupil's answer ; and a reinforcing consequence to the response—the feedback of the correct response. Here is an example from a spelling programme:

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[1] Biran, L., Unpublished programmes on Heredity and D.N.A. *Nat. Centre for Prog. Learning. University of Birmingham*, 1966

Question	*Response*	*Consequential feedback*
Add ING to these words	pupil's answer	
Allot	correct	allotting
Omit	or	omitting
Recur	incorrect	recurring

Answers are usually open-ended and the feedback of information is given immediately, usually on another page.

The learning consists mainly of active solution finding, as in the above simple case calling for a solution to the problem in the doubling of the consonants. Such learning is operant conditioning as described in Chapter II, Section (vi).

The subject matter of the programme, say spelling or chemistry, has to be sampled to produce many such simple learning units which lead on from one to the next in imperceptible stages, the whole sequence building up cumulatively. The single items, called frames, are chosen such that there is something like a 95% chance of answering them correctly. The whole sequence is designed on the basis of successful learning (see Chapter V, Section (iv)).

The imperceptible growth of knowledge may lead to boredom in abler pupils but programmes can be shortened to cover the same ground in larger steps by fewer frames.

The relative value of overt and covert responding, that is by active writing as opposed to silent reading of the answer, has produced much research (see Leith, *op. cit.*) and generally the results seem to indicate that overt active responding is better for younger, less able, less sophisticated learners and where the material to be learned is very novel (even for older learners; see Buckle[1]).

On the other hand older, abler learners with material that develops from their existing knowledge seem to go on better with covert responding.

(*b*) *Branching Programmes*

In branching programmes, as we saw on page 134, a connected piece of material is put before the learner who has then to answer a question on it using a multiple choice technique. The passage and question are so chosen that wrong answers may come up. These are then used diagnostically to improve the understanding by branching the learner off on a route which includes more explanation and exercise.

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[1] Buckle, C. F., *A study of the effects of different modes of responding, to a self-instructional programme in electronics, on learning retention and transfer*. Unpublished M.Ed. research, University of Birmingham School of Education, 1966.

The fundamental difference between the two types of programme is in their attitudes to and use of errors. The linearist will have nothing of errors ; the brancher uses them when they occur to further the learning. Also the branching programme progresses in bigger steps by teaching the pupil much more before he is questioned.

The relative value of the two kinds of programme has been the subject of several researches (see Leith, *op. cit.*) and, in consequence, generally the consensus of opinion is that linear programmes are more suited to less able, younger and less sophisticated learners whereas branching programmes are more acceptable and efficient for older, abler and more knowledgeable learners.

Both kinds of programme, and all the intermediate and extended variants mentioned, are produced in book form. Teaching machines can be used for the basic prototypes and for any programme calling only for verbal responses to verbal material.

Quite apart from the value of programmed learning as a straight instructional technique, for pupils and students, it has great potential as a research tool for comparing variations in teaching. The reason is that progress through a learning programme is strictly controlled and it is no mere chance that much of the research carried out by Leith and his colleagues and by Gagné on methods of teaching have yielded significant results. When we use ordinary teaching methods, we can never be sure that the teacher has actually carried out the prescriptions set up.

(vi) *Reading List*

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Anderson, H. H. 'Domination and Socially Integrative Behaviour', Ch. XXVII in *Child Behaviour and Development*, ed. Barker, R. G., Kounin, J. S. and Wright, H. F. (McGraw-Hill, New York).

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Remedial Methods

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(vii) *Exercises*

1. Recall any skill or intellectual attainment you have recently acquired and note any evidence of the three phases of attention described in this chapter, paying special attention to any devices you used to sustain interest during the middle phase.

2. Memorise any passage of poetry and note the way in which the passage assumes a structure, particularly the noticeable features of the passage.

3. Discuss the view that only the mature person can be disciplined.

4. Observe a child who is failing to make progress in a school attainment, noting particularly the way in which he achieves need reduction, either positively or negatively.

5. Recall any instance of blockage to your own progress in the mastery of a skill or attainment and note your emotional responses and subsequent actions.

6. Obtain copies of linear and branching programmes. Note the features of these programmes mentioned in Section (vi).

CHAPTER VII

THE STRUCTURE OF THE MIND

(i) *Individual differences* (ii) *Faculty psychology* (iii) *Mental structure* (iv) *Spearman's two-factor theory* (v) *Thomson's sampling theory* (vi) *Burt's hierarchical structure* (vii) *Primary mental traits* (viii) *Reading list* (ix) *Exercises*

(i) *Individual Differences*

In the preceding five chapters we discussed the way in which learning takes place but we said little about the individual differences that distinguish one pupil from another. We allowed for differences between the learners only so far as to suggest that dull children may gain relatively more from teaching which makes the most of reinforcement and that brighter children reach the stage of insightful learning very rapidly.

We now turn to the individual qualities, innate and acquired, which make each child what he is. These account for his potentialities and limitations, his temperament and ultimately, under the influence of environment, for his whole personality.

Since the time of Galton, who was the first to study the innate psychological qualities that different people possess, the empirical study of individual differences has proceeded hand in hand with theories about the pattern of mind, temperament and emotions. We can put it also as follows. Collecting data about individual abilities, attainments and character traits yields two pieces of information :

(i) the typical individual and the range and variety of individuals ;

(ii) underlying mental and emotional structures.

The second is obtained by comparing persons and, apart from the ancient faculty psychology, became possible only after Galton had given social scientists the concept of correlation. Modern structural theories of mental life are based on the correlation between pupils' different traits and achievements. The elements of the structure are usually called factors or dimensions of mind. As it is commonplace nowadays to describe a pupil's intellectual abilities and emotional make-up in terms of these factors, we shall first examine some of the more important theories before passing on to material on the psychological differences between individual children.

The structural theories of particular interest to the educational psychologist are :

Faculty psychology
Theories of mental structure
Part of McDougall's instinct psychology
Theory of temperamental traits and types.

These systems are concerned with innate or acquired patterns of mental abilities, emotional traits and instincts. They are not concerned with the *way* in which mental powers and traits develop, deteriorate or are arrested. It is true that McDougall first gave us the idea of substitute activity, that is, the alternative activity which ensues when an instinct or urge is blocked, but our immediate problem is in the pattern of instincts (Ch. XI), its relative fixity and the use of the pattern to explain individual and social behaviour. In the present chapter we shall discuss theories of mental structure.

(ii) *Faculty Psychology*

According to faculty psychology—the oldest structural theory—the mind is composed of a number of faculties or powers, each relatively independent of the others.

Since the Middle Ages the major faculties of *knowing*, *feeling* and *willing* have played a big part in the theories of the nature of the soul. The faculties of *judgment*, *memory* and *imagination* were also recognised, and the number of these separate faculties grew larger as time went on. At the end of the eighteenth century the Scottish philosopher Reid gave a list of thirty powers of the mind, including the faculties of *imitation*, *self esteem*, *pity*, *duty*, *perception*, *judgment*, *memory*, *conception* and *moral taste*. The number of these powers increased to thirty-seven in the early part of the nineteenth century and were related to certain parts of the cranium by the phrenologists Gall and Spurzheim.

What were the main features of faculty psychology? Undoubtedly it must have started as a principle of classification of mental and spiritual life by the functions of the soul: for example, knowing, feeling, hungering, reasoning and doing. The crude intuitions of common sense, introspection, self-observation and speculation would supply the means for reaching this knowledge. These faculties constitute aspects of human experience as anyone can show by self-observation. Also, as principles of classification, they have great value in delineating fields of psychological enquiry. They still appear as main headings in textbooks of psychology and provide a useful scheme for dividing up psychological study.

However, faculty psychology did not stop at this stage, for, after beginning perhaps as descriptions of functions, the faculties took on the *power* of effective agencies. They became material causes, each relatively independent of the other. Locke's oft quoted lines are the most apt criticism of this mode of describing mental activity:

> 'We may properly say that the singing faculty sings, dancing faculty dances, as the will chooses, understanding conceives.'[1]

Although it still forms the intuitive grounds for much commonsense belief, both in and out of the classroom, about the nature of mind and certainly enters into the categories of modern factorial analysis, we need not concern ourselves too much with this speculative psychology. In the main it has historic interest only. We have already referred to its important educational offshoot, the doctrine of transfer of training, which starts from the assumption that the relatively independent agencies called faculties may be trained by the right sort of mental exercise.

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[1] Locke, *Essay on Human Understanding*

(iii) *Mental Structure*

The theory of mental structure has a very different background, for, whereas 'faculties' were defined largely as the result of introspection and speculation, 'mental factors' were studied by experimental methods. This does not mean that preconceived hypotheses, such as that of faculties, have not influenced the work of Galton, Spearman, Thomson, Burt and Thurstone. All these workers were affected by the current philosophies of their time and milieu: Galton by principles of heredity, Spearman by Galton, Thomson by current views on neural structure, Burt by his own teacher McDougall and Galton, Thurstone by the American disbelief in a single general property of mind. As I commented elsewhere [1] it is important to take account of the 'background' hypotheses and beliefs of the different protagonists. It is quite clear that no factorial theory has emerged solely from the empirical test score and correlation data.

Different mental tests are applied to numerous children or adults. The test scores are then subjected to mathematical and statistical analysis in order to arrive at the underlying *factors* of mental ability. The process of analysis is called *factor analysis* and has formed a considerable part of psychological and psychometric researches carried out in Britain and America since Spearman first discussed intelligence in 1904 and gave us mental factors in 1912.

The empirical study of the structure of the mind can be traced back to Galton, when [2] he introduced the idea of correlating two sets of test results. Correlation is the very kernel of the method of analysing mental ability into its factors. The measure of correlation between two tests is called the *correlation coefficient*. Let us consider how it can help us to discover the nature of mental ability.[3]

Suppose we have the marks in English and arithmetic of five children as set out in the first two columns of Table 7.

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[1] Peel, E. A., *Uppsala Symposium of Psychological Factor Analysis*, March 1953. Nordisk Psykologi's Monograph No. 3.

[2] Burt, C., 'The Two-factor Theory' *B.J.P. (Stats.)*, p. 15, Nov. 1949
Peel, E. A., 'Francis Galton' *B.J. Ed. Psych.*, Feb. 1954

[3] The reader is referred to *Measurement of Abilities* by P. E. Vernon for the usual methods of calculating the correlation coefficient.

TABLE 7

	English	Arith-metic	Moments about the average		Prod. Moment	Squares of Moments	
			English	Arith-metic		English	Arith-metic
	1.	2.	3.	4.	5.	6.	7.
John .	5	7	0	1	0	0	1
Bill .	9	10	4	4	16	16	16
Mary .	2	5	−3	−1	3	9	1
Sue .	6	6	1	0	0	1	0
Harry .	3	2	−2	−4	8	4	16
Total .	25	30	0	0	27	30	34
Average .	5	6					

A glance at the pairs of marks for each child in columns 1 and 2 shows that there is some correspondence or *correlation* between achievements in English and arithmetic. The average English mark is 5, and the average for arithmetic is 6.

We can bring out the correlation more clearly if we express each mark as a deviation from the corresponding average mark. This has been done in columns 3 and 4. We see that on the whole high marks in English are associated with high marks in arithmetic and that in each subject low marks occur also together. We say there is some correlation between the English and arithmetic marks. This correlation can be expressed as a single coefficient ranging in value from $+1$ for perfect association to -1 for perfect inverse association. If low English marks were paired with high arithmetic marks and vice versa, then we should have inverse association. If there were no relationship at all between marks of each pair the coefficient would have the value zero. The correlation coefficient we now use was developed by Pearson; it is symbolised by r and is called the *product moment* correlation coefficient.

The reasons for this again emerge if we look at column 5. The first step in calculating r is to form the products 0×1, 4×4, -3×-1, 1×0 and -2×-4 from columns 3 and 4. The total of these products is then formed. The physicist uses the word *moment* to express the kind of qualities we have in columns 3 and 4. They are the *moments* about the average scores. We need also the squares of the moments for each subject and these are given in columns 6 and 7. Their totals are 30 and 34. It was Galton's earlier inability to correct for these sums of squares that held him up for many years in the discovery of correlation. Then the product moment correlation coefficient is given by

$$r = \frac{\text{sum of the products}}{\sqrt{\begin{matrix}\text{squares of the}\\ \text{arith. moments}\end{matrix} \times \begin{matrix}\text{squares of the}\\ \text{Eng. moments}\end{matrix}}}$$

$$= +\frac{27}{\sqrt{30 \times 34}} \quad = \quad \frac{27}{31 \cdot 94}$$

$$= \quad +{\cdot}85 \text{ approx.}$$

On the scale of the full range of r, $+1 \ldots 0 \ldots -1$, $r = {\cdot}85$ is near to $+1$ and so indicates a high degree of correlation between English and arithmetic. We might put it in another way: that performances in English and arithmetic by the five children have much in common. On the basis of the five pupils chosen, we should expect children who do well in one subject to do well in the other. In terms of mental capacity, there must be something common to the capacities to do English and arithmetic.

This small artificial example epitomises the experimental and analytical method of research workers endeavouring to analyse mental ability into its factors. The main features are:

(1) the use of empirical data obtained by giving examinations and tests

(2) the calculation of correlation between the examinations and tests

(3) the further inferences from the correlation coefficients which can be made about the abilities underlying the children's performance in the examination and tests. This stage is called 'factorial' analysis.

Let us consider this last stage in greater detail. Supposing we tested the same children not only in English and arithmetic but also in geography and art and obtained the following table of marks.

TABLE 8

	English	Arithmetic	Geography	Art
John . . .	5	7	8	3
Bill . . .	9	10	8	5
Mary . . .	2	5	4	4
Sue . . .	6	6	10	7
Harry . . .	3	2	5	1
Average . .	5	6	7	4

The correlation coefficients between each pair of subjects may be calculated as previously and they may be tabulated as follows :

TABLE 9

	English	Arithmetic	Geography	Art
English . .		$\frac{27}{\sqrt{30\times34}}$	$\frac{20}{\sqrt{30\times24}}$	$\frac{13}{\sqrt{30\times20}}$
Arithmetic . .			$\frac{16}{\sqrt{34\times24}}$	$\frac{15}{\sqrt{34\times20}}$
Geography . .				$\frac{15}{\sqrt{24\times20}}$
Art . . .				

When worked out, the following table of correlation coefficients is found.

TABLE 10

	English	Arithmetic	Geography	Art
English . .		·85	·75	·53
Arithmetic . .	·85		·56	·58
Geography . .	·75	·56		·68
Art . . .	·53	·58	·68	
Sum . . .	2·13	1·99	1·89	1·79

If we examine the correlation coefficients between English and the other three subjects, arithmetic, geography and art respectively, *i.e.* ·85, ·75, ·53, we notice that there is a corresponding fall in the values of r. All are +ve and therefore something is common to all: some common ability appears to underlie achievement in the four subjects, but English has more in common with arithmetic and geography than with art. This is also shown by adding the coefficients as we have done in the table.

Examination of the correlation of art with English, arithmetic and geography (*i.e.* in the last column, ·53, ·58 and ·68 respectively) shows that art generally has lower correlations with the other three subjects but that it has slightly more in common with geography. The coefficients then tell us three things:

(1) There is something common to all subjects.

(2) English possesses most of this common quality, as the column-sums show.

(3) Art possesses least of this common property, and by inference it may possess some special quality *or* it may be more difficult to measure or assess reliably.

These qualities are called mental factors, and it is the business of the factor analyst to isolate and identify these factors. This he does by giving many tests to many persons, and his method of analysing the resulting table of correlation coefficients is logically similar to the casual comparisons which have just been made. His techniques are, however, more exact, refined and, needless to say, mathematically more complicated. We may now turn to the principal theories about mental factors.

(iv) *Spearman's Two-factor Theory*

The empirical aspect of Spearman's theory of intelligence is so frequently stressed that its background of contemporary psychological theory may be overlooked. At the end of the nineteenth century the long-held view of separate independent faculties[1] was being superseded by the belief in a single unitary ability' Spencer and Galton had taken this idea from the current theories of biological evolution, and at the time of Spearman's first interest in the problem of intellectual power the British [1] view was that intelligence was made up of a single power, allied with more specialised abilities each of which accounted for activity in a *group* of allied achievements.

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[1] Burt, C., 'Two-factor Theory of Intelligence' *B.J. P.* (*Stats.*), Nov. 1949

Spearman compared the performance of two small groups of children in Oxford in various tests with their school achievements.[2] He found positive correlations between all the material and showed that the quality of intelligence common to any pair of tests and examinations was the same thing as that common to any other pair and that *all* the similarity between tests and examinations could be explained by a single general factor of intelligence which he later called 'g'. Furthermore, the specialised abilities suggested by Galton as explaining more specialised groups of activities could not be found. There were indeed specialised abilities, but each was so specific as to be particular to a single test. A child's score on any test could be accounted for completely by a certain amount of *general* ability together with an amount of the

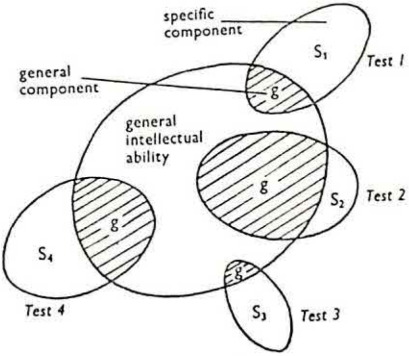

FIG. 26

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[1] In America Wissler and Thorndike had found such low correlation between dissimilar material, *i.e.* tests of speed, memory, sensory acuity and academic subjects, that the idea of a general intellectual power seemed untenable. This view has persisted in American educational psychology and shows itself in certain ways, such as their attitude to the curriculum and towards aptitude testing.

[2] See Burt, C., 'Two-factor Theory of Intelligence' *B.J.P.* (*Stats.*), Nov. 1949

specific ability required for the particular test—hence the name, two-factor theory of intelligence. We may represent this theory diagrammatically, but not rigorously, in Figure 26. The shaded portion of the ellipse represents the amount of 'g' measured by the test. Some tests have more 'g' than others, *e.g.* Test 2 may represent a verbal intelligence test possessing a large amount of 'g', and Test 3 an art test. measuring little 'g' but requiring much specific ability. The specific portion of each test is represented by the unshaded portion, outside the area representing 'general intellectual ability' into which each test dips, as it were.

Algebraically we may represent a child's scores, s_a and s_b, in two tests A and B, as follows.

$$s_a = m_a g + n_a s_a$$

$$s_b = m_b g + n_b s_b$$

'g' is the common factor of general ability, s_a is specific to Test A, and s_b to Test B. m_a, n_a, m_b and n_b are the amounts or 'loadings' of these factors. Later Spearman showed that if his two-factor theory explained test and examination scores. then the table of correlations between different tests would have certain clearly definable mathematical properties. Not only should the individual correlation coefficients all be positive, but they could be arranged on a hierarchy beginning with the largest in the top left-hand corner and ending with the least in the bottom right-hand corner. We may have five tests, 1, 2, 3, 4, 5, the correlations between pairs of which are indicated by r_{32} r_{36} . . . . which are then arranged as below in hierarchical form.

TABLE 11

Test	1	2	3	4	5
1		r_{12}	r_{13}	r_{14}	r_{15}
2	r_{12}		r_{23}	r_{24}	r_{25}
3	r_{13}	r_{23}		r_{34}	r_{35}
4	r_{14}	r_{24}	r_{34}		r_{45}
5	r_{15}	r_{25}	r_{35}	r_{45}	

Here r_{12} is the largest and r_{45} is the smallest correlation coefficient. The hierarchy is such that the columns are proportional, that is

$$\frac{r_{13}}{r_{23}} = \frac{r_{14}}{r_{24}} = \frac{r_{15}}{r_{25}}.$$

Similarly,

$$\frac{r_{24}}{r_{34}} = \frac{r_{25}}{r_{35}} \quad \text{and} \quad \frac{r_{12}}{r_{23}} = \frac{r_{14}}{r_{34}} = \frac{r_{15}}{r_{35}}$$

and so on.

We may take any pair of the above equal ratios, say

$$\frac{r_{12}}{r_{23}} = \frac{r_{15}}{r_{35}},$$

and cross multiply to get

$$r_{12} \times r_{35} = r_{15} \times r_{23}$$
$$\text{or } r_{12}r_{35} - r_{15}r_{23} = 0.$$

This is Spearman's condition for hierarchy, namely that the *tetrad differences*, such as $r_{12}r_{35}-r_{15}r_{23}$, should each be zero. Spearman claimed that this was realised in his tables of correlations, or at least as nearly realised as one would need to expect.

This beautifully simple theory of intellectual ability soon met criticism. In the first place the fact of hierarchy merely *demonstrates* generality, it does not *explain* the nature of the general factor of intelligence—whether it is simple or complex —and Thomson was quick to show that an entirely different *theory* of intelligence would explain the *fact* of hierarchy.

(v) *Thomson's Sampling Theory* [1]

In this theory Thomson assumed the mind to be made up of many independent powers. Any particular test or school examination samples some of these powers or bonds. In so far as two tests sample the same bonds then a general or common factor can be said to exist between them, but in so far as they sample different bonds then the tests have nothing in common and each is specific. Diagrammatically we may represent the sampling theory as in Figure 27. Tests B, C and D have something in common—the powers sampled in the shaded areas. The double-hatched shading represents 'g', the three areas of single-hatched shading represent group factors, and the unshaded parts represent specific factors. Test A has nothing in common with Tests B, C and D.

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[1] Thomson, G. H., *Factorial Analysis of Human Ability* (U.L.P., London)

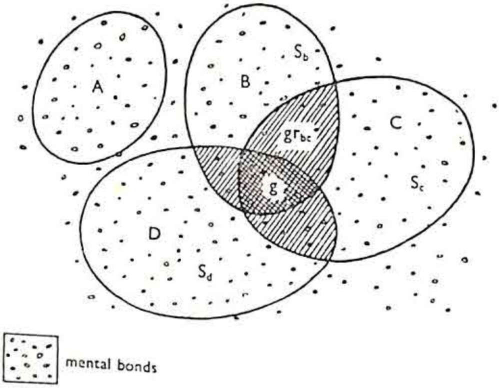

FIG. 27

The sampling theory not only explains hierarchy as well as the two-factor theory; it also underlines the *relativity* of any general factor and any set of specific factors, for the nature of the overlap of several tests and of their specific non-overlap is seen to depend on the nature of the assembly of tests used. A test which is specific in one battery may be general in another. and so on. It also explains why more complex activities like English and arithmetic, or Latin or mathematics, possess more 'g', for 'g' is not unitary, but a 'complex'.[1]

But a more serious criticism appeared when it was found that the pure hierarchy could be only rarely achieved. In most cases a proportion of the tetrad differences do not come to zero. This means that the simple picture of general and specific factors is not adequate. Spearman and his co-workers were soon 'purifying' the battery, that is, removing tests which had specific factors in common. Later the presence of group factors, such as verbal ability, numerical ability and speed, had to be admitted.

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[1] Thomson was also responsible more than any other psychologist for developing the geometrical picture of mental factors. The reader may consult Chapter IV in *Factorial Analysis of Human Ability* and Thomson's last book *Geometry of Mental Measurement* (U.L.P.) where the implications of the geometrical model are clearly set out.

The two-factor theory also implies that vocational and educational guidance and selection by tests is impossible. Vocation and secondary education call for special aptitudes in the sense that an aptitude can be found for a class of closely allied occupations, say various forms of engineering, draughtsmanship, fitting and the like. But the Spearman specific factors are each peculiar to one test. Hence no test can be used to predict any intellectual quality or aptitude other than 'g'.

Lastly, as a technique of analysis, the calculation of tetrad differences is extremely laborious; the number of tetrads mounts rapidly with the addition of each new test to the battery.

In all then the two-factor theory is not the only explanation of the facts on which it is based: these facts themselves rarely exist, the theory would not permit of vocational guidance by tests, and as a method it is very laborious.

British psychologists in general—and Thomson and his co-workers in particular—have returned to a point of view not unlike that of Galton and Pearson in assuming a general factor of intelligence combined with more specialised group factors. However, as a rough estimate, Spearman's two-factor theory is still useful, for the group factors often do not account for much of the variance of the test results.

(vi) *Burt's Hierarchical Structure*

Burt holds the view that factors are descriptive categories and has advanced a theory of the structure of mind in which a place is found for all types of mental ability: general, group and specific. This is called the hierarchical[1] structure. Following Spencer, Stout and McDougall he assumes that there is a hierarchical organisation of mind based on the specific sensori-motor activities. This theory may be represented as follows.

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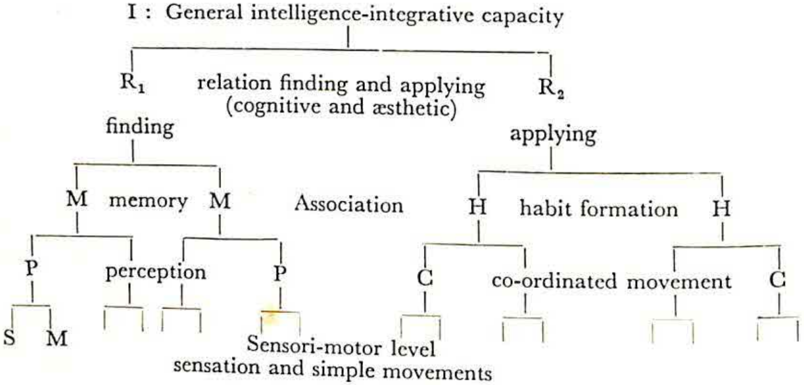
[1] The use of the word hierarchical in this respect has nothing to do with the numerical hierarchy required in the table of correlation coefficients by the Spearman two-factor theory.

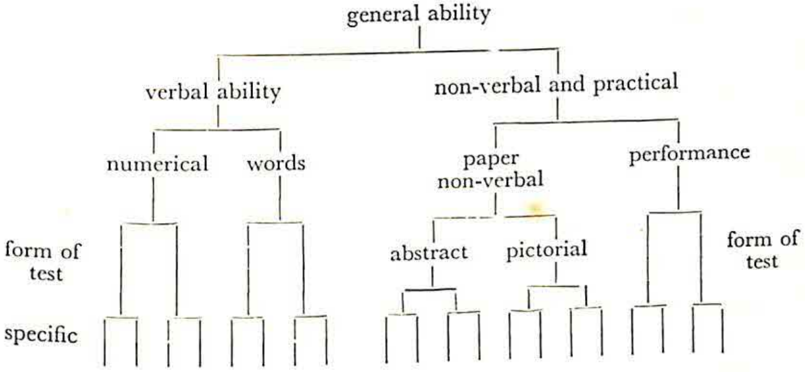


In Burt's own words,

> 'the processes of the lowest level are assumed to consist of simple sensations or movements (S, M) such as can be artificially isolated and measured by tests of sensory "thresholds" and by the timing of "simple reactions". The next level includes the more complex processes of perception (P) and co-ordinated movement (C), as in experiments on the apprehension of form and pattern or on "compound reactions". The third is the associative level—the level of memory (M) and of habit formation (H). The fourth and highest of all involves the apprehension or application of relations (R). "Intelligence" (I), as the "integrative capacity of the mind", is manifested at *every* level, but these manifestations differ not only in degree, but also (as introspection suggests) in their qualitative nature.'

Under the heading of *relation* finding we include the thought processes, generalisation, abstraction, logic and combination of relations. It includes also the aesthetic processes, appreciative and creative. At the *associative* level we include innate memory span, productive imagination, visual and audible imagery, verbal ability, arithmetical ability, vocabulary, practical ability (including spatial and mechanical ability).

It is not easy to get a battery of tests which will reveal Burt's hierarchy exactly, but whenever a mixed battery of tests, verbal, non-verbal, performance, etc., is analysed into its factors, a hierarchy is found, often going along the following lines.



(vii) *Theory of Primary Mental Traits*

In America a further alternative theory of mental structure was developed by Thurstone. He could find no evidence of a general factor underlying all mental activity but was able to isolate several primary group factors which might overlap each other in given tests in various degrees. These are :

V *verbal comprehension*, brought into action in tests of reading, verbal analogies, disarranged sentences, verbal reasoning, proverb matching, vocabulary

W *word fluency*, shown in anagrams, rhyming, naming words in a given category (words beginning or ending with a given letter)

N *number*, revealed in speed and accuracy in simple arithmetic

S *space*, including perception and orientation of fixed spatial relations and the visualisation, manipulation and movement of parts

M *associative memory*, equivalent to rote memory for paired associations and for recall of nonsense syllables and numbers

P *perceptual speed*, shown in quick and accurate grasp of visual details, similarities and differences

R *reasoning*, tested by syllogistic reasoning, by completing a series of numbers, and in problems of classification

Here the reader should be clear that the data from which Thurstone obtained his primary abilities can be analysed equally well to give a general factor, group factors and specific factors, resembling the British view put forward by Thomson and Burt. In some of his more recent work Thurstone finds a place for a general factor which in many ways resembles Spearman's 'g'.

Readers will find a comprehensive account of the results of applying factor analysis to ability tests of all kinds in Vernon's *Structure of Human Abilities*.[1]

Summary

We have, then, *three* important theories of mental structure, whose bearing on the work of the teacher we shall later consider. They are: the Spearman two-factor theory; the British theories which assume general, group and specific factors; and the theory due to Thurstone in which a number of primary abilities are assumed. The three theories can be represented diagrammatically as follows.

Factors

Test	g	s_1	s_2	s_3	s_4	s_5	s_6
1	×	×					
2	×		×				
3	×			×			
4	×				×		
5	×					×	
6	×						×

Spearman
A

Factors

g	g_1	g_2	$g_3 \dots$	s_1	$s_2 \dots$
×	×		×	×	
×	×				×
×		×	×		
×	×	×	×		
×	×	×			
×		×			

Thomson and Burt
B

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[1] Vernon, P. E., *Structure of Human Abilities* (Methuen, 1950)

Factors

Test	p_1	p_2	p_3	p_4	p_5	p_6	p_7	$s_1 \ldots$
1	×		×			×		×
2	×			×		×	×	
3		×	×			×	×	
4	×	×		×	×			
5		×	×	×	×		×	
6			×		×			

Thurstone
C

In these diagrams the crosses (×) represent the factor weights ascribed to each of six tests, and where there are no × entries no factor is present.

Thus in the case of Spearman's interpretation (Diagram A), all tests partake of factor 'g' and each test has its own specific factor (s_1 etc.).

In the case of Thomson and Burt's interpretation in Diagram B, all tests partake of 'g' and some tests, but not all together, partake of different group factors, g_1, g_2, etc.; remaining peculiar to each test is a specific factor 's'.

In the case of Thurstone's interpretation there are seven primary abilities which enter some of the tests in varying degrees. No primary ability is common to all tests. Specific factors claim the residual.

The two-factor theory is not really adequate to explain the data obtained from numerous empirical studies on the nature of intellectual abilities. Either the British theory of hierarchy, of intellectual abilities, including general, group and specific factors, or the American theory of primary abilities, is adequate to explain the data. The fact that one can either assume a general factor or dispense with it, as Thurstone does, shows our views of mental structure depend on what we wish to know or assume.

(viii) *Reading List*

Burt, C. 'The Two-factor Theory of Intelligence', *B.J. P. (Stats.)*, Vol. II, p. 151, 1949.

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Burt, C. *Factors of the Mind* (U.L.P., London).[1]

(ix) *Exercises*

1. Examine the following data for correlation between performance in English and arithmetic.

Pupil	Arithmetic marks	English marks
A	15	10
B	6	2
C	12	7
D	11	5
E	18	8
F	8	4
G	7	6
H	3	3
I	12	9
J	8	6

First calculate the average of each set of marks. Next express the marks as deviates from the respective averages, and then proceed as on page 108 to calculate the correlation coefficient.

2. The following correlation coefficients have been obtained between the subjects geography, history, English, music and French. Examine the results for evidence of a general factor underlying performance in the four subjects. Which has most of this factor? Which subject appears to be most *specific*?

	Geography	History	English	Music	French
Geography . .		·24	·40	·08	·32
History . .	·24		·60	·12	·48
English . .	·40	·60		·20	·80
Music . .	·08	·12	·20		·16
French . .	·32	·48	·80	·16	

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[1] For advanced reading only

CHAPTER VIII

INTELLIGENCE

(i) *What is intelligent behaviour?* (ii) *Different kinds of intelligence* (iii) *Testing of intelligence* (iv) *Statistical concepts required in intelligence tests* (v) *Extraneous influences* (vi) *Reading list* (vii) *Exercises*

(i) *What is Intelligent Behaviour?*

WHENEVER we talk of intelligence we must be on our guard against ascribing to it the powers which faculties assumed. Strictly speaking we behave or act intelligently. It is a mode of action, and we now enquire what characterises such action.

There are two ways of tackling the problem. We may first consider the qualities of intelligent activity—taking it for granted that common sense and experience may enable us to judge intelligent behaviour. In the main we know who are intelligent and who are not. We may judge children by the way they carry out tests, by how they learn, by their ability to take instructions and carry out commissions. When we look at adults we have even more opportunities of judging how intelligent their actions are, but in this case we may be more put off by the habits, manners and prejudices developed in individuals during their lifetime. At all events, by the observation of ourselves and others, we may arrive at essential features of intelligent behaviour.

Secondly we may take a group of children or adults and compare their attainments and capacities as measured by examinations and tests, and by analysis of the results we may arrive at the common qualities underlying their responses. Factor analysis is such a method. This method, which we shall discuss in the next section, gives an operational[1] definition in terms of the material of the examinations and tests, but the content of these same tests has been chosen as a result of the kind of thinking which is implied in the first method, namely, that which we think distinguishes intelligent behaviour, determines the test and examination items we use.

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[1] That is, in terms of the operations required to work out the test

As examples of the first kind of analysis we may take the following. *Ebbinghaus* stressed the important part played in intelligent behaviour by integration or synthesis. *Binet* considered that good judgment and reasoning were essential parts of intelligent action. Nevertheless, Binet also made great use of simple memory and association tests in his *practical* measure of intelligence. *Stern* stated that intelligence was the ability to adjust oneself to new situations. *Burt* too emphasises this aspect of intelligent behaviour and also insists on the all-round innate nature of intelligence. The assumption that intelligence is innate underlies all discussion of intellectual differences and of the relationship of ability to attainment and development. Evidence from studies of inheritance in Galton's time amply confirm this view. Intelligence is associated in some way with the physiological and anatomical make-up of the brain and central nervous system and the system of ductless glands also plays its part. *Terman* recognised the place of abstract thinking in intelligent behaviour. This aspect is obviously of supreme importance in all higher learning and creation through the use of language and other special symbolisms.

Thorndike emphasised that intelligence was the capacity to form associations. Invention and nearly all creative activity provide examples of the formation of associations. The aeroplane, Leonardo da Vinci's inventions, the apparatus invented by the scientist, creative mathematics, ability to do problems in mathematics, and aptitude for translating foreign languages, all provide evidence of associations. So are the fantasies of day dreams, the distinction between fantasy and constructive imagination being a practical one: the constructive or controlled associations will work, those of fantasy will not. In constructive imagination the imaginer does something about it, and in fantasy he does not.

Thurstone's description of intelligence as the capacity to make impulses focal at their early unfinished stage of formation is closely connected with Thorndike's association theory; it can be regarded as a generalisation of Thorndike's view, for when associations are *formed* the impulses have been made *focal*. *Knight's* definition [1] also draws attention to the associative element, the power to discover new relations and is as follows.

> 'In an intelligent act with reference to some aim we first discover the relevant qualities of the objects and ideas and then evoke other relevant ideas. It is the capacity for relational constructive thinking, directed to the attainment of some end.'

In the last phrase Knight stressed an aspect of intelligent behaviour which was not often mentioned by earlier writers and is often neglected even today by intelligence testers, namely that intelligent behaviour must be *motivated*. For instance, if we hope to get the best result out of a child when we give an intelligence test, we must ensure that the test stimulates him. This is even more important with adults who often resist efforts to interest them in intelligence test material.

A novel view of intelligence is held by *Piaget*.[2] He writes that 'behaviour becomes more intelligent as the pathways between the subject and the objects on which it acts cease to be simple and become progressively more complex'. Less obvious relationships are only perceived by the more intelligent person. Only the unintelligent are naïve. An example might be the difference between enumerating the details of a picture and recognising what is pleasing or has significance in the picture.

Spearman did not identify 'g', the general factor of intellectual ability, with particular mental processes, but we are told very clearly in his work on the principles of cognition [3]—and we can also infer from his tests—what he thought were the important mental processes in intelligent behaviour. These are given in his two principles of cognition (*i.e.* of knowing or building up knowledge):

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[1] Knight, R., *Intelligence and Intelligence Testing* (Methuen, London)

[2] Piaget, J., *The Psychology of Intelligence* (Routledge, Kegan Paul, London)

[3] Spearman, C., *The Nature of Intelligence and Principles of Cognition* (Macmillan)

(*a*) A person tends to find relations between the parts of any apprehended material.
(*b*) If a presentation is apprehended by a person and a relationship presented with it the related experience or concept (correlate) is also evoked.

Thus as an example of the first we might present the words *hunger—food*, and the relationship of *eat* or *consume* would come to the mind of most people. To illustrate the second we might use the simple analogy,

hunger : food : : thirst : ?

In this analogy we require the fourth term (?) of the analogy. Most of us would suggest *drink* or some synonym. The first pair suggest a relationship of satisfaction : food satisfies the hunger. We are given *thirst* and the relationship *satisfaction*, and the response *drink* is evoked. In choosing the relation between *hunger* and *food* we are guided by the word *thirst*, the third term of the analogy.

Many other kinds of test items are suggested by Spearman's principles of cognition, but before we look at some examples we should consider the proposal made by *Hamley* that an intelligent person must be able to carry out the following operations :

(1) classify material
(2) find a name for a class of material
(3) order the members of a class
(4) correlate the members of two ordered classes.

Hamley was a mathematician before taking up educational psychology and took his four principles from the field of mathematical logic. They lead to similar kinds of test material as Spearman's principles and give meaning to much of the earlier material used by Ebbinghaus, Binet and Thorndike.

Examples to illustrate the application of Hamley's principles in practice in intelligence tests are :

First Principle

Look at the following words, find the word most unlike the others and put a line under it :

apple rose pear plum apricot

Second Principle

Look at the following words, find the word which is the general word of which the other words are special examples :

apple peach pear fruit orange

Third Principle

Imagine the following words placed in order and underline the one which would come in the middle :

shilling sixpence halfcrown florin crownpiece

Fourth Principle

Underline the word on the right which should go into the blank space :

rain : wet : : fire :. . . . burns, big, hot, smoky, extinguished

The reader may notice that Spearman's principles of cognition will also account for these items.

(ii) *Different Kinds of Intelligence*

The operational way of defining intelligence is by analysing the results of applying batteries of tests to groups of children or adults. By this method Spearman confirmed the two-factor theory, for as we have read on page 147 he found that the results of applying many tests reveal a general quality of intelligence (g) and specific qualities (s_1) as many as the number of tests used, each being peculiar to one test only.

Anyone who examines the items of the Binet test, say the Terman-Merrill revision or Burt's revision, will readily notice the variety of material used. It seems that whatever Binet *said* about intelligence, when he came to *measure* it he used different kinds of tests involving different kinds of intellectual abilities. Thus there are tests of perception, vocabulary, reasoning and memory. This prompts one to ask whether there are special mental abilities or different kinds of intelligence corresponding to the different categories of items used by Binet.

Burt [1] investigated this problem years ago at the time when the two-factor theory was very much in vogue. He found evidence of group abilities, each of which explained a genus of tests. There was a factor of general intelligence, by far the most important, and the group abilities which he called respectively the verbal factor, manual factor, memory factor, discrimination (perceptual), together with a component identified as general information. Later, from the middle thirties on, there came a spate of factorial analyses of intelligence, the result of which was to confirm beyond doubt that there are different kinds of intelligence.

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[1] Burt, C., *Mental and Scholastic Tests*, pp. 135-9 (Staples, London)

TABLE 12

Factor Loadings (after Thurstone and Thurstone)

Test	P	N	W	V	S	M	R
Identical Numbers	·4	·4					
Faces	·5	·2			·2		
Mirror Reading	·4		·2				
First Names						·5	
Figure Recognition	·2					·3	
Word Number						·6	
Sentences				·7			
Vocabulary				·7			
Completion				·7	·2		
First Letters			·6				
Four Letter Words			·6				
Suffixes			·5	·2			
Flags					·7		
Figures					·8		
Cards					·7		
Addition		·6					
Multiplication		·7					
Three higher		·4			·2		·2
Letter series							·5
Pedigrees				·2			·4
Letter grouping							·4

Thus we have the list of primary mental abilities due to Thurstone.[1] The weights or *loadings* of these factors in twenty-one tests are given to one decimal place in Table 12, loadings of ±·1 being neglected to facilitate interpretation of the material. Four hundred and thirty-seven school children were tested. The entries in Table 12 correspond to the × entries in Diagram C on page 155. The letters refer to the primary abilities which have already been listed in the previous chapter, namely, P—perceptual speed, N—number ability, W—word fluency, V—verbal comprehension, S—capacity to deal with spatial relations, M—immediate memory, R—reasoning. These primary abilities, however, can be resolved into even more specialised factors. Thus by restricting the tests to *verbal* material it has been shown that V and W can be resolved into such things as richness of linguistic responses, fluency in oral speech, ideational fluency, verbal versatility.

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[1] Thurstone, L. L. and T. G., *Factorial Studies of Intelligence* Psychometric Monograph No. 2 (Chicago University Press)

TABLE 13

435 *boys*, 1947—8½-9 *years*

Test	I	II	III
Verbal			
Schonell's Essential . . .	·90	−·32	−·06
Durham Verbal A . . .	·89	−·37	·09
Durham Verbal B . . .	·87	−·41	·04
Pictorial			
Cattell	·83	·17	·22
Otis	·81	·06	·06
Sleight	·89	·17	·13
Non-verbal			
NV	·80	·09	−·11
Peel Group Test 1 . . .	·79	·30	−·13
Peel VS 10	·75	·24	−·16
Relative importance of the factors (per cent contribution to the total test variance) . .	70	7	2

In this country much research carried out since the beginning of the Second World War has produced consistent evidence of group abilities such as the verbal-numerical (or verb-educational) v : ed factors, so written since these factors are important requirements for the educability of the pupil,[1] spatial factors (k : m) included space perception (k), practical ability (f) associated with performance material, and manual and motor intelligence (m).

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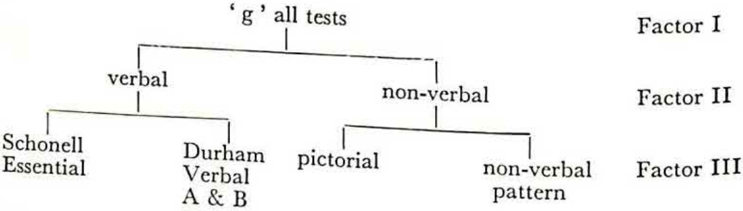
[1] Vernon, P. E., *Structure of Human Abilities* (Methuen, London)

Furthermore, by using pictorial material with abstract non-verbal material, such as patterns, designs and abstract shapes, one may distinguish between a pictorial response and the usual space factor (k). This was demonstrated in research on the abilities of primary school children.[1] (Table 13).

The first factor (I) is general to all tests ; the second (II) distinguishes between the three verbal tests and the six pictorial and non-verbal tests, and the third factor (III) distinguishes on the one hand between the Schonell Essential and the Verbal Tests A and B which are similar to each other, and on the other hand between the three pictorial tests and the three non-verbal pattern tests. In terms of Burt's hierarchy we should have the following picture :



When we included performance tests as well we obtained the results shown in Table 14.[2] Here again factor analysis of the tests has demonstrated the existence of general, spatial, verbal, pictorial and performance factors.

Evidence obtained from the analysis of school subjects points to an artistic factor, a special form of intelligence revealed in art creation, understanding and appreciation,[3] but more work is required to relate aesthetic appreciation to general intelligence.[4]

The results of testing adults in the armed services, both in this country[1],[2] and in America,[3] has also confirmed the existence of these group factors of intelligence. These specialised group abilities are very important in connection with secondary education, higher education and vocational guidance, but many people do not realise their significance for the primary school. The data quoted from research by Burt and Peel and Graham show that the group abilities associated with verbal, pictorial, spatial, and performance material are clearly in evidence in children as young as eight years of age. For the teacher this means that the primary school curriculum should not be so narrowly conceived as it sometimes appears and that there are good psychological grounds for broadening it.

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[1] Peel, E. A. and Graham, D., 'Differentiation of Ability in Primary School Children—I', *Research Review*, p. 4, 1951

[2] Peel, E. A., and Graham, D., 'Differentiation of Ability in Primary School Children—II', *Research Review*, 1952

[3] Burt, C., 'Structure of Abilities', *B.J. Ed. Psych.* I and II, June and November 1949

[4] Peel, E. A., 'On Identifying Aesthetic Types', *B.J. Psych.* XXXV, 3

TABLE 14

	I	II	III
Verbal			
Schonell Essential	·9	·4	zero
Durham Verbal Ab (A)	·8	·4	−·1
N.V. 'g' test	·7	·1	−·1
Pictorial			
Cattell	·8	·2	·2
Otis	·8	·2	zero
Sleight	·8	·1	·1
Non-verbal			
Peel Gp.T.i.	·8	−·2	·1
Peel V.S. 10	·8	−·2	·2
Performance			
Peel's Blocks	·7	−·3	−·5
Cube Construction	·7	−·2	zero
Kohs Blocks	·7	−·3	−·1
Tray	·6	−·2	−·1

(iii) *Testing of Intelligence*

TYPES OF TEST

There are two broad classes of tests which are used today for measuring intelligence: individual tests and group tests.

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[1] Vernon, P. E. and Parry, J. B., *Personnel Selection in the British Forces* (U.L.P.)

[2] Vernon, P. E. *Structure of Human Abilities* (Methuen)

[3] Thorndike, R. L., *Personnel Selection: Test and Measurement Techniques* (Wiley, New York)

Individual tests follow in the tradition of the well-known test first devised by Binet and Simon to measure the intelligence of mentally defective children. This test was later developed for measuring the intelligence of all children and has been amended and revised several times since. Notable revisions are those of Burt [1] and Terman and Merrill.[2] The latter revision is very widely used in English-speaking countries. Valentine [3] also produced an individual test of intelligence which has much in common with the various revisions of the Binet test. Most performance tests, Kohs Blocks, Cube Construction, Alexander's Passalong,[4] the form boards, and a Blocks test devised by the writer,[5] to mention only a few, are also individual tests.

(1) *Group Tests*

Group tests have a shorter history. The entry of the United States into the First World War is usually accepted as the beginning of group testing. The Americans were faced in 1917 with the problem of testing many recruits quickly, and devised the group test to meet the difficulty: that is, a test which can be taken by a large group of people at once. Very soon group tests caught on in the testing and grading of school children. In Great Britain Thomson and his co-workers at Moray House have been the biggest agency for promoting the widespread use of group test material. Thomson and Burt's original Northumberland Tests were first issued in the early 1920s.

Since the group test of intelligence enables us to test large groups of children at once it has been almost universally used by local education authorities for purposes of grading and selection of pupils for different forms of education. For the same reason it has found wide use by the military and by research workers investigating the qualities of intelligence and predicting aptitudes.

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[1] Burt, C., *Binet (London) Revision.* See *Mental and Scholastic Tests,* 1921 (Staples)

[2] Terman, L. M. and Merrill, M. A., *Measuring Intelligence* (Harrap)

[3] Valentine, C. W., *Intelligence Tests for Children* (Methuen)

[4] Alexander, W. P., *The Alexander Performance Scale* (Nelson)

[5] Peel, E. A., Unpublished *Blocks Test,* Education Department, University of Birmingham.

The tests normally require 20-60 minutes to do, for most are timed. Very often the items of the test are arranged in order of difficulty. Broadly speaking there are two forms in which a group intelligence test can be set out : the omnibus form in which the testee proceeds through the test to a time limit set for the whole test ; or the sub-test form in which the test is really made up of several smaller tests, each of which is timed separately, and the items of which are separately arranged in order of difficulty. Each sub-test usually contains one kind of item, say, one made up of analogies, another of reasoning problems, and so on. There are advantages and disadvantages in both kinds of test. In the omnibus test the child is left in peace for the whole period of testing whereas in the sub-test form he has to be interrupted at the end of the time allocated to each sub-test in order to start him on the next. It is generally not considered desirable to have sub-tests of less than five minutes' duration. On the other hand evidence has been produced that the long period required for the omnibus form leads to fatigue and boredom which is reflected in the test score. In the sub-test form this element is not so evident, and we can more safely assume that a child's score is free from fatigue effects and reflects his real intellectual limits.

Speed and Power Tests

A power group test is one in which the items are arranged from the easiest to the most difficult and in which the testee is given as much time as he requires to answer as many items as he can. (Cf. Thorndike's concept of altitude of intelligence. See Chapter X). A speed test is normally composed of items of a similar degree of difficulty, and the testee is limited to a set time for the test. This concept of intelligence has something in common with the Thorndike concept of breadth of intelligence (Ch. X), particularly if the items of similar difficulty are drawn from different fields—verbal, numerical, non-verbal, etc.

In actual practice most tests used for selecting pupils for secondary education combine speed and power, that is, the items are arranged in order of difficulty and a time limit is set on the test. We may ask whether the time limit set on the tests may do injustice to the slow accurate plodder. Evidence obtained from correlating speeded and unspeeded tests shows that at 11+ the abler child is also the speedier child. Furthermore the time limit imposed on most group tests is not so restricted as to make speed an important element to anyone except the very slowest, and these children are not the ablest. Also when viewed as a prognostic tool, the test should take speed into account, for the pupil in the secondary school or the apprentice in a vocation has to be able to work reasonably quickly.

There is evidence of a speed factor in simpler motor and mechanical activity and it also seems that this factor is more evident when older people are tested, but it is very difficult to get anything like a consistent description of the extent to which speed is a separate factor in the hierarchy of mental abilities. In Sweden the problem has also been investigated in connection with finding tests which do justice to the Swedish rural population in the north of the country. Opinion is that speed is a cultural factor linked with urban and industrial life and that the countryman, by the nature of his life and work, may tend to be slower.

The group test can be used with advantage for normal children who have a reading age of not less than eight years. For children whose reading attainment does not reach this level the printed verbal instructions of the group test may prove too difficult. But this difficulty might be overcome by presenting the material orally as is done in the Moray House Picture Test [1] and in the orally presented test devised by Cornwell.[2] It is a very curious fact that the rubrics of instructions in verbal tests may act as a barrier and that if these details are read aloud to the children they perform much better on the *verbal* material of the tests.

Another reason for not giving a group test until a child has had a year or so in the primary school is that in the group test we take for granted that the child is sufficiently regimented by classroom procedure to carry out written instructions. The advantages of the standardised objective group test are that

[1] Mellone, M., *Moray House Test I* (U.L.P.)

[2] Cornwell, J., *An Orally Presented Group Test of Intelligence for Juniors* (Methuen)

ambiguous questions have been eliminated in the preparation of the material, that the children's answers can be marked objectively and quickly. Also by the uniform conditions of group testing the atmosphere is the same for all. This uniformity may, however, be illusory and even irrelevant, for the important thing is that each child should feel at ease so that his test score is a measure of intelligence and not a reflection of emotional tension.

Group tests of intelligence may be verbal, pictorial or symbolic and spatial. In the items of a verbal test use is made of words and numbers. Typical examples are :

(*a*) Complete the following sentence by selecting a word from those appearing on the right.

Apple is to fruit as bus is to....... (tram, cart, vehicle, taxi)

(*b*) Complete the following :

2 9 28 65 ( ) ( )

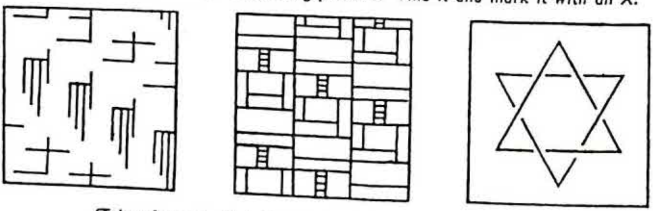
Verbal tests are to be recommended for all normal purposes and for selection for the grammar school. The chief means of social communication and the chief advance of knowledge is through the use of words. Hence it is most important to be able to assess verbal ability. But there are cases where the verbal test would be of less use. Such occur when we suspect that a child's development and schooling have not been normal. It will be obvious to the reader that the verbal test of intelligence makes use of *learned* material, words and numbers. The underlying assumption in the use of verbal tests is that every child tested has had a normal background and schooling. If this condition is not fulfilled then the test is invalid and may give rise to a false measure of intelligence.

The reliability of verbal tests is generally very high.

Group pictorial tests may be used for young children and non-readers. They involve verbalised thought, through the medium of pictures, but do not require reading attainment. They are particularly useful for testing children in the age range 7-10.

Group non-verbal tests make use of abstract geometrical patterns and designs. Here are examples.

There is a fault in each of the following patterns. Find it and mark it with an X.



(Taken from the *Peel Group Test of Practical Ability*, Nelson)

FIG. 28

Some non-verbal tests merely claim to measure general intelligence 'g',[1] others general and spatial intelligence 'g+k'.[2] The amount of 'g' measured by a non-verbal test is rarely so high as that measured by a verbal test.

Non-verbal tests may be used whenever we wish to assess intelligence apart from the verbal influences and whenever we have reason to suspect that a person's background and schooling have not been normal, or if a child suffers from any reading disability. They are also better to use when reading attainment is to be compared with intellectual capacity. They are preferable to pictorial tests for older pupils and adults since they may be made as difficult as we please.

A list of types of items commonly used in group tests is given below.

The items are often designed to conform with recognised logical concepts and methods: the class, order in the class, the variable (name), correspondence, the syllogism, etc. (See the reference to the principles of Spearman and Hamley earlier in this chapter.)

Verbal Tests

(1) Find the word in the row which is most unlike the others and draw a line under it.

shoes coat hat gloves face

(2) The set of words below can be arranged in order.

---

[1] N.F.E.R., Jenkins Test

[2] Peel; Moray House; N.F.E.R. Space Tests

Think of the set arranged in order and draw a line under the word which comes in the middle.

halfpenny farthing pound halfcrown florin

(3) The words to the left in the row below are arranged in order. The blank space shows where one word has been left out. One of the five words on the right should fill in the space. Find this word and draw a line under it.

minute, ... day, week (second, year, month, hour, evening)

(4) In the example shown below, you notice that red, blue, yellow and green are all colours, and so the word 'colour' has been underlined.

Example : red blue yellow colour green

Now do this in the same way :

sparrow rook bird thrush robin

(5) In the row below, the sentence on the left can be completed by one of the words on the right. Find this word and draw a line under it.

Shoal is to fish as flock is to.......... (girls, cows, shepherd, dogs, sheep)

(6) The sentence to the left can be completed by two of the words to the right. Find these two words and draw a line under both.

Horse is to neighs as.......... is to.......... (roars, squeaks, lion, prowls, leaps)

(7) In the row of words to the right draw a line under the word which means most nearly the opposite of the word on the left.

Long..........shallow small heavy short big

Reasoning Tests

(1) Mary can run faster than Jean, but not so fast as Pam. Sue runs faster than Pam.

(i) Who is the fastest runner ? (Mary, Jean, Pam, Sue)
(ii) Who is the slowest runner ? (Mary, Jean, Pam, Sue)

(2) The table shows the villages where a group of 41 children lived and the classes they were placed in at school. Look at the table. You see that there were 6 children from Norton in Class A, and so on for the other numbers in the table.

Classes	A	B	C
Norton . .	6	7	3
Middleton .	3	9	2
Sutton . .	2	1	8

Answer the following questions from the table.

(i) How many were there in Class A who did not come from Norton?

(ii) How many children who were not in Class A or Class C did not come from Norton or Middleton?

(3) The message THIS WAY OUT is written in code as
UIJT XBZ PVU

Can you see how this code is obtained?
If so, write EXIT in the same code. ....
What word is written as HPOF in code? ....

(4) Tick off the statement below *which must be true* if the two statements printed in capitals are correct.

MARY HAS RED HAIR.
RED HAIRED PEOPLE SOMETIMES HAVE QUICK TEMPERS.

Mary is bad-tempered. ....
Mary is always losing her temper. ....
Quick-tempered people have red hair. ....
Mary may be quick-tempered. ....

Numerical Relations

(1) In the following row of numbers there is one which is unlike the others. Find this number and draw a line under it.

3 5 11 13 9

(2) In the following row of numbers there are two blank

spaces showing where two numbers are missing. Fill in the spaces with the numbers you think should be there.

3 8 13 18 .. ..

Tests compiled of the foregoing three types of items: verbal, reasoning and numerical relations, are often called Verbal Reasoning Tests. They measure verbal intelligence generally.

(2) *Individual Tests*

Group tests are objective in the marking but are not sensitive to the children's emotional differences. These differences may affect the test scores. Individual tests are slower to use but give the tester a much clearer impression of the pupil being tested, and his emotional responses may be observed very closely and responded to accordingly. The individual test is therefore to be recommended whenever results of group testing are in doubt, for borderline cases or abnormal cases. The individual test is also to be preferred for younger children who cannot read or who are not accustomed to the regimentation and group methods of the classroom. The tester may thus eliminate elements which are irrelevant to the purpose of intelligence testing.

The Terman-Merrill revision of the Binet test is very frequently used for testing general intelligence and is issued in two parallel forms, L and M, which contain memory items, memory for numbers and sentences, reasoning items, vocabulary tests, following instructions, and so on.[1]

(iv) *Statistical Concepts required in Intelligence Testing*[2]

(*a*) *Reliability and Validity*

All tests, whether group or individual, have to fulfil certain conditions of rigour. They must be *reliable*, that is, they must yield consistent results, so that when a person is tested on two occasions by the same test his score will remain sensibly unaltered. Secondly, the test must be *valid*, that is, it must test what its author claims. Thus a test of intelligence should correlate highly with *other* assessments of intelligence (the criteria). *Reliability* and *validity* are usually expressed as correlation coefficients, the first between two applications of the same test to the same people, and the second between the test and the criterion, both applied to a single group of people.

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[1] Terman, L. M., and Merrill, M. A., *Measuring Intelligence* (Harrap, London)

[2] See Vernon, P. E., *Measurement of Abilities* (U.L.P., London)

(*b*) *Standardised Scores*

An intelligence test must not only be objective, reliable and valid, but it must also enable the user to compare different children, irrespective of school or locality or test used. When the test enables one to do this it is said to be *standardised.* In order to standardise the scores we must know something about their distribution.

When the heights of a large random sample of men are measured and arranged in a distribution according to the number of men possessing given heights, we obtain a *frequency distribution* which can be drawn as a continuous hump-backed curve as follows :

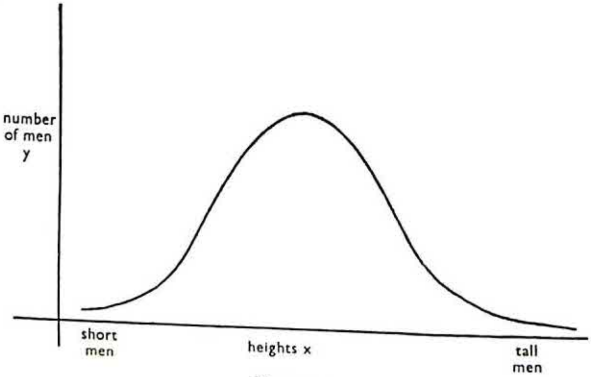

FIG. 29

Thus there are relatively few short and tall men and scarcely any dwarfs and giants. Most men have average height. Galton and anthropologists following him have confirmed that this curve fits very closely to the normal or gaussian curve.[1] Many other physical properties are also distributed in this way, and we also *assume* that many innate mental qualities, including intelligence, are also distributed according to the same law.

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[1] The equation to the normal curve is $y=\frac{N}{\sigma\sqrt{2\pi}}e^{\frac{-x^2}{2\sigma}}$ where N is the total number of men and σ is a constant, the standard deviation of the distribution.

Suppose we test a group of children and then arrange their scores in a frequency distribution as shown by the *continuous* line in the following figure.

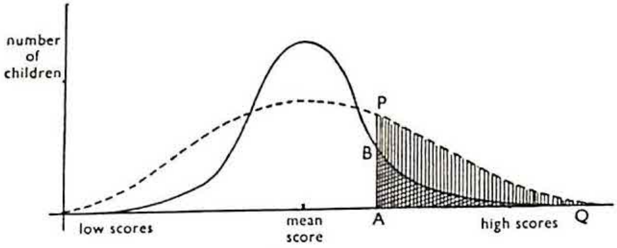

FIG. 30

Most children score marks around the average or mean, and the number of children making scores above and below the mean will diminish, the higher and lower the scores become. The *mean score* for the group of children gives us a line of reference with which to compare individual children. We can say how far a child's score departs from the mean (negative if less, positive if more). We could call this score his deviation from the mean.

But the *mean* score is not the only quality we require to know about the marks of groups of children. The dotted line in Figure 30 represents the scores of the same children on a second test. Let us suppose the mean score on this test is the same as the previous one. A glance at Figure 30, however, shows that the two distributions of marks clearly differ in another respect. The marks in the second test are much more widely dispersed—the highest marks are higher than those on the first test and the lowest marks are lower than any in the first. We measure the dispersion or 'scatter' of the marks about the mean by the *standard deviation*.[1] In the diagram the standard deviation of the second distribution is larger than the first.

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[1] The standard deviation is defined as follows: If the average score of a distribution of n scores is m then each score x can be regarded as a deviation d from the average, $d=x-m$. The sum of the deviations is zero (this follows from the meaning of the average score), but if the deviations are each squared and averaged we have the *variance* $\frac{\Sigma d^2}{n}$. The standard deviation is the *square root* of the variance $\left(\sqrt{\frac{\Sigma d^2}{n}}\right.$.

Suppose now a boy scores the same mark 'A' in both tests. Are these marks equivalent? Superficially they are the same, but if, in Figure 30, we compare the shaded areas APQ and ABQ we see that more people in the second test (area APQ) score marks which exceed 'A' than do so in the first test (ABQ). A mark then of 'A' in each test does not mean the same thing. 'A' marks in the first test indicate a better performance than 'A' marks in the second because the second distribution of marks is more widely scattered.

Different tests are said to be *standardised* when their marks are referred to the *same mean* and the *same standard deviation.*

(*c*) *Standardisation to an I.Q. Basis*

The standardisation of the Binet test and its revisions has gone along slightly different lines. Here we have separate items, to each of which is ascribed an age *norm*, that is, the *age* of the group of children, half of whom pass the item, half of whom fail it.

Supposing we have an item as follows: "Repeat after me 285"; and we give this to three groups of children of ages (*a*) 2 years 9 months, (*b*) 3 years, (*c*) 3 years 3 months. Suppose our findings are:

Group	Per cent fail	Per cent pass	
2 yrs 9 mths	65	35	too difficult
3 yrs 0 mths	50	50	norm is 3 yrs 0 mths
3 yrs 3 mths	37	63	too easy

Then the norm of the item is 3 years 0 months.

When the test is applied we allow the child to progress through the items as long as he continues to score something in each year's items. We then collect the total number of years and months that he has passed (as items) and so obtain his *mental age.*

The norm of a group test is the number of items passed by a given age group, and a child has a mental age (M.A.) of ten years if he answers as many items *correctly* as the *average* child of ten years of age. The child's actual age (number of years since birth) is called his *chronological age* (C.A.). It is of obvious value to know how a child's mental age compares with his chronological age. This is done by his intelligence quotient (I.Q.), which is defined as follows.

$$\text{I.Q.} = \frac{\text{M.A.}}{\text{C.A.}} \times 100$$

Thus a bright child of ten years who does as well as the average child of fourteen years has a mental age of fourteen years and an I.Q. of 140. A dull child of thirteen years four months whose mental age is nine years four months has an I.Q. of 70. The mental age of a child of average ability is the same as his chronological age and his I.Q. is 100. The I.Q. is a *rate* of development (change of M.A. per C.A.), and we believe that it is sensibly constant for any individual.

In this method of computing intelligence quotients we are really comparing a child, not with other children of his own age group, but with those of a different age group. Thus in our first two examples we had a ten-year-old child compared with a fourteen-year-old, and a thirteen-plus years old with a nine-plus years old.

It is often more desirable to compare a child with his own age group, that is, his performance with the average performance of children of his own age. This is the method suggested in Section (*b*) (pp. 174-76). We now enquire whether we can standardise in this way and yet arrive at standardised scores which bear some correspondence with intelligence quotients. It is possible by first finding how the intelligence quotients of a large random population of children are distributed and then obtaining the mean I.Q. and the standard deviation of the I.Q. (as in the footnote on page 175). When this is done the mean I.Q. is about 100, which we might expect, and the standard deviation is between 15 and 17 points of I.Q.

When a group test is standardised to a mean of 100 and a standard deviation of 15, it may be said to be standardised to an I.Q. basis. This is in fact the basis to which nearly all British group tests are standardised, but there are other bases—one to a mean of 50 and standard deviation of 10, which is called a T score. Another useful standardisation, particularly for school marks since it gives high marks about 90 and low marks rarely below 30, is to a mean of 60 and standard deviation of 10. The figures do not look unlike percentages and they commend themselves for school reports for parents' reading !

So far we have been concerned only with standardisation of test scores obtained from a single age group. But often we test a group of children whose ages range over a year, as occurs when primary school children are tested for secondary school allocation. It is usual to group the scores according to each month of age. Thus if the age range is from 10 : 0 to 10 : 11, we should have twelve distributions of scores for the ages 10 : 0, 10 : 1, 10 : 2, etc. Here are some results taken from a recent test.

Age	10 : 0	10 : 1	10 : 2	10 : 3	10 : 4	10 : 5	10 : 6	10 : 7	10 : 8	10 : 9	10 : 10	10 : 11
Mean .	41·83	39·67	43·80	45·34	46·95	44·19	46·53	49·95	51·58	53·11	55·67	54·12
S.D. .	23·58	22·56	21·88	22·73	22·77	22·71	22·46	22·03	24·36	24·76	21·41	23·37

Although there are fluctuations in the mean score from month to month, the general upward trend of the means is apparent.

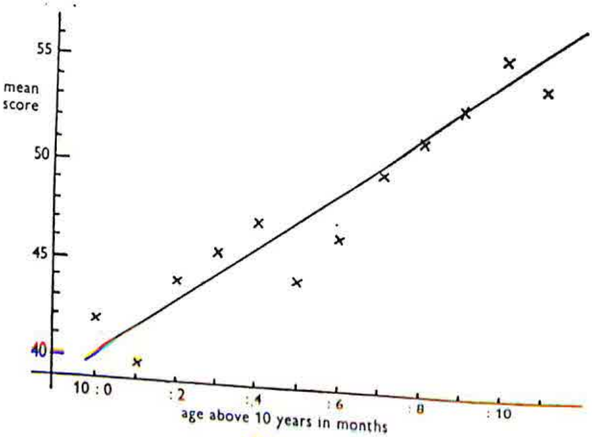

FIG. 31

The average boy of age 10 : 11 scores some twelve points more than the average boy of age 10 : 0. If we are to select boys of the *same* mental calibre at each age we must allow for age, expecting more of the older boy than the younger boy. We could make a start by fixing the line of best fit to the mean score. This line would enable us to read off the raw score at any age which corresponds to a standardised I.Q. score of 100. By finding the line of best fit to the scores which are one standard deviation above the mean we should obtain the line of standardised scores 115. By subtracting the relevant standard deviation from each mean we should obtain the line of standardised scores 85. It is therefore possible to build up a table of norms giving the standardised I.Q. score corresponding to each raw score for every month of age.

(*d*) *Rank Arrays*

The rank array of scores enables us to outline another statistical concept of great use to the mental tester. It is the percentile rank. We arrange the scores in a test from highest to lowest score :

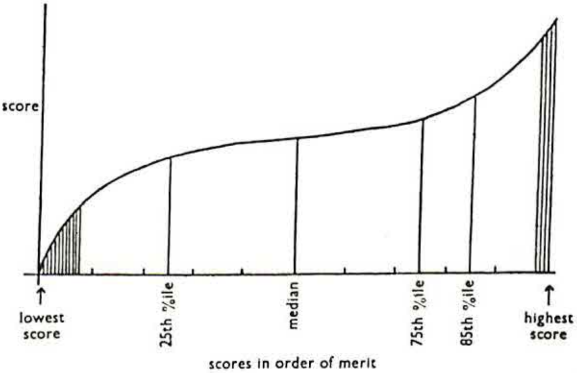

FIG. 32

Percentile ranks are derived from this rank order. They refer to a standard basis of 100 and so enable one to compare groups of different sizes. Thus the 50th percentile or the median would be the mark halfway down the order of merit of any group chosen. Similarly one speaks of the deciles (that is, the 10th percentile, the 20th percentile and so on) and the quartiles (that is, the 25th percentile and the 75th percentile.) When we use percentiles the usual direction of the order of merit is reversed, and that child who was previously first in order of merit becomes the child at the 100th percentile. Very often local authorities are really only concerned with an order of merit for selection purposes. Thus children may be selected for grammar schools down as far as the 85th percentile. This is another way of saying that 15 per cent. of the children are selected for grammar schools.

(v) *The Influence of Extraneous Factors on Scores in Intelligence Tests*

Although intelligence is an innate quality, when we *measure* it we have to do so by making use of material and situations which the child has *learned* through experience. Observed intelligence, whatever we say about untested intellectual potential, is the only intelligence which we can use for guidance and diagnosis. Even when we assess a person intellectually in a casual meeting we do so by various clues as to how he talks and acts. This is true not only of verbal and pictorial material but also of more abstract items making use of symbols and formal patterns. It is only possible to ascribe norms to intelligence tests by assuming that the children tested have had a normal schooling and an unexceptional home background. When fresh individuals are tested on other occasions by such standardised material their scores can be assumed to reflect intelligence and nothing else only when their experience has been that common to most children. Performance in test material depends to some extent on experience, background and knowledge of test material and methods. We now consider evidence relating to the influence of four of these extraneous factors, namely, practice, coaching, schooling and cultural environment.

Practice

The effect of practice on the results of an intelligence test may be shown by giving two similar tests at an interval of, say, four weeks from each other. If this is done anything up to an *average* rise of five points of I.Q. may be obtained.[1] Later evidence shows that this effect extends over intervals of up to six months. If the children tested have already had some experience of testing, the gain does not exceed three points of I.Q. The increases in score obtained by bright children tend to be greater than those obtained by dull children. Between I.Q. 70 and I.Q. 125 there is a steady linear increase.[1]

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[1] Peel, E. A., 'A Note on Practice Effects in Intelligence Tests', *B.J. Ed. Psych.* XXI, June 1951

Upon applying a third test a further rise occurs but it is much smaller than the practice effect between the first and second testings. Table 15 shows the diminution which is found.[2]

TABLE 15

	Average I.Q.'s			Average practice effects	
	1st Test	2nd Test	3rd Test	between 1st and 2nd tests	between 2nd and 3rd tests
Boys— n=651 . .	96·9	100·8	101·3	3·9	·5
Girls— n=588 . .	99·1	103·0	103·9	3·9	·9

The small second practice effect is concentrated mainly among the abler children.

Coaching

Coaching in intelligence tests involves going through test instructions, explaining the kind of items used, giving practice in the items, explaining the principles underlying the items, and giving instructions as to the best way of working through a test. The effects of coaching are very marked, ranging anywhere from nine to eighteen points of I.Q. according to the brightness of the child and his lack of previous experience. The highest results are obtained with bright children who have had no previous experience of the tests. Vernon and his research student Navathe[3] showed that the total amount of coaching makes little difference, some few periods, three to five, being almost as effective as ten periods. Vernon is also of the opinion that over-coaching does not improve the pupil's score beyond the earlier improvement and that coaching effects wear off after a period of a few months. Other workers, Wiseman[1] and Dempster,[2] have also shown significant changes due to coaching. In the main they show effects of anything up to eleven points of I.Q.

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[1] Peel, E. A., 'A Note on Practice Effects in Intelligence Tests', *B.J. Ed. Psych.* XXI, June 1951

[2] Peel, E. A., 'Practical Effects between Three Consecutive Tests of Intelligence', *B.J. Ed. Psych.* XXII, Nov. 1952

[3] Vernon, P. E., 'Intelligence Testing: I—After Practice and Coaching; II—Coaching for all Advised', *Times Educational Supplement*, Jan. 25 and Feb. 1, 1952

Effects of Schooling

In Sweden, Husen[3] has shown that normal schooling may produce a rise of something like five to seven points of I.Q. and in a publication by the National Foundation for Educational Research[4] the relative effects of primary and secondary modern schooling on intelligence test scores are demonstrated. According to the authors, continued schooling in the secondary school produces a fall in I.Q. whereas if the child continues in a primary school there is a rise in the I.Q. Broken schooling and shortened schooling also has a marked effect on test results.

Cultural Influences

The cultural influences which affect the results of intelligence tests include first the language handicap. Much research has been conducted on the testing of different language groups or bilingual groups,[5] and generally the expected differences in verbal tests and other tests having verbal instructions are not found if the instructions are given in each group's first language. There are also difficulties with regard to the place that pictures, instructions and so on have in certain cultures.

There is also the effect of the administration of a test to a cultural group by a *stranger* or outsider to the group. Suspicion and even hostility does not make for the motivation which is the common assumption of all testing. This is also linked with the different cultural traditions and manners with regard to attitude and speech between individuals (pp. 733-7 [1]). It is bad form in some groups to answer a question in the presence of someone who does not know the answer. Furthermore, different ethnic groups, whether or not as a result of cultural influences, tend to score relatively higher marks on verbal as opposed to non-verbal or performance test items. Jewish children often record higher scores on verbal material.

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[1] Wiseman, S., 'Symposium on the Effects of Coaching and Practice in Intelligence Tests—IV', *B. J. Ed. Psych.* XXIV, 1954

[2] Dempster, J. J. B., 'Symposium on the Effects of Coaching and Practice in Intelligence Tests—III', *B. J. Ed. Psych.* XXIV, 1954

[3] Husen, T., 'Influence of Schooling upon I.Q.', *Theoria* XVII, 1951

[4] Watts, A. F., Pidgeon, D. H. and Yates, A., *Secondary School Entrance Examination*, N.F.E.R. Publication No 6, 1952 (Newnes, London)

[5] Anastasi, A. and Foley, J. P., *Differential Psychology*, Ch. 21 (Macmillan) 1949

American studies have also shown that the level of *measured* intelligence is associated with socio-economic level, and in further work on the relation of occupational level and socio-economic level they show that the correlation between I.Q. and socio-economic level cannot be solely attributed to a genuine preponderance of weaker intellect in, say, the negro population. Both factors operate in the poorer communities—lack of opportunity and low intellect. This is something we should bear in mind when considering the causes of inter-school variation in intelligence test scores.

Even material for non-verbal tests—the designs and patterns—has to be carefully chosen in view of cultural influences.

Whilst most of the startling cultural effects shown in mental testing refer to groups which are culturally more divergent from each other than we know of in the British Isles,[2] it is possible that culture-biassed tests or items may escape our notice.

(vi) *Reading List*

KNIGHT, R. *Intelligence and Intelligence Testing* (Methuen, London).
PIAGET, J. *The Psychology of Intelligence* (Routledge, Kegan Paul, London).
HAMLEY, H. R. *et al.* *The Testing of Intelligence* (Evans, London).
SPEARMAN, C. *The Nature of Intelligence and Principles of Cognition* (Macmillan, London).
BURT, C. *Mental and Scholastic Tests*, pp. 135-9 (Staples, London).
THURSTONE, L. L. and THURSTONE, T. G. *Factorial Studies of Intelligence* Psychometric Monograph No. 2 (Chicago).
VERNON, P. E. *Structure of Human Abilities* (Methuen, London).

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[1] Anastasi, A. and Foley, J. P., *Differential Psychology*, Ch 21 (Macmillan) 1949
[2] Not so true with the large increase in the numbers of immigrants.

Peel, E. A. and Graham, D. 'Differentiation of Ability in Primary School Children, I and II', *Research Review*, p. 4 and p. 31, 1951, 1952.

Burt, C. 'Structure of Abilities', *B.J. Ed. Psych.* XIX, June and November 1949.

Peel, E. A. 'On Identifying Æsthetic Types', *B.J. Psych.* XXXV, 3, May 1945 (pp. 61-9).

Vernon, P. E. and Parry, J. B. *Personnel Selection in the British Forces* (University of London Press).

Thorndike, R. L. *Personnel Selection: Test and Measurement Techniques* (Wiley, New York).

Burt, C. *Binet* (*London*) *Revision.* See 'The Binet-Simon Scale' in *Mental and Scholastic Tests*, 1921.

Terman, L. M. and Merrill, M. A. *Measuring Intelligence* (Harrap, London).

Valentine, C. W. *Intelligence Tests for Children* (Methuen, London).

Alexander, W. P. *The Alexander Performance Scale* (Nelson, Edinburgh).

Peel, E. A. Unpublished *Blocks Test*. The Education Department, University of Birmingham.

Mellone, M. *Moray House Picture Test I* (University of London Press).

Cornwell, J. *An Orally Presented Group Test of Intelligence for Juniors* (Methuen, London).

Vernon, P. E. *The Measurement of Abilities* (University of London Press).

Peel, E. A. 'A Note on Practice Effects in Intelligence Tests', *B.J. Ed. Psych.* XXI, June 1951. 'Practice Effects between Three Consecutive Tests of Intelligence', *B.J. Ed. Psych.* XXII, Nov. 1952.

Vernon, P. E. 'Intelligence Testing · I—After Practice and Coaching; II—Coaching for all Advised', *Times Educational Supplement* Jan. 25 and Feb. 1, 1952.

Anastasi, A. and Foley, J. P. *Differential Psychology*, Ch. 21 (Macmillan, New York).

(vii) *Exercises*

1. Devise three items each of verbal, pictorial and geometric-abstract type, embodying Spearman's two principles of cognition.

2. Compile two sets of five items of any kind intended to test the child's ability (*a*) to classify and (*b*) to order the individual members of a group.

3. Plot a graph of the following mean test scores obtained by groups of children of the ages indicated and calculate the age allowance per month which should be allowed on the basis of the straight line of best fit. (Fit the line visually.)

Age	10 : 4	10 : 5	10 : 6	10 : 7	10 : 8	10 : 9	10 : 10	10 : 11	11 : 0	11 : 1	11 : 2	11 : 3
Mean score	43·1	37·2	42·1	40·5	44·4	41·6	44·5	48·5	45·7	49·7	49·6	53·4

4. Comment on Joan's pairs of marks in the following cases. (*a*) French and mathematics, (*b*) science and needlework.

(*a*)

	Joan's mark	Class mean
Maths	20	15
French	18	14

(*b*)

	Joan's mark	Class mean	Stand. dev.
Science	25	30	10
Needlework	25	30	5

5. Devise six reasoning test items suitable for an 11-15 year old group.

6. Compare and contrast the use and value of group and individual tests of intelligence.

CHAPTER IX

INDIVIDUAL DIFFERENCES

(i) *Introduction* (ii) *Abilities* (iii) *Aptitudes* (iv) *Attainments* (v) *Interests* (vi) *Conclusions* (vii) *Reading list* (viii) *Exercises*

(i) *Introduction*

IT was suggested that two things come out of the testing movement. First we obtain an insight into the structure of mental life and the nature of intelligence and, secondly, a knowledge of the mental differences that distinguish individuals. We discussed the structure of mind in Chapter VII and the nature of intelligence in Chapter VIII. Let us now turn to individual differences, particularly those of use to the educational specialist in grouping children into suitable classes, in the allocation of pupils to secondary schools, in assessing the child's school progress and in vocational guidance.

The most important qualities for these purposes are the individual's abilities, aptitudes, attainments, interests and attitudes. There are also temperamental and emotional differences, but we shall discuss these in Chapter XI.

(ii) *Abilities*

We have seen that individuals vary in both the *quality* and *quantity* of their intelligence. Three broad categories of intelligence have been identified in British school children when they are about to enter secondary schools. These are general intelligence, verbal intelligence (including ability in number) and practical-spatial intelligence. Variations in these three kinds of intelligence are sufficient to make possible allocation of primary school children into secondary schools, even though tests of verbal intelligence and spatial intelligence correlate to the extent of ·5, owing to the common presence of general intelligence.

It is also possible to distinguish within general intelligence between memory and the ability to reason and find relations. With American students Thurstone identified primary abilities, which include verbal ability, word fluency, numerical ability, memory, spatial ability, reasoning and perception.

In order to study variations between individuals in the quantity of intelligence we may take the results of applying a verbal intelligence test designed for a 10-11 year old population. Many of the published and unpublished tests contain about one hundred items and the mean scores usually fall within the score range of 40-50 correctly answered items. The standard deviations of the distributions of scores are equal to 20 or thereabouts. These tests therefore reveal a wide range of individual differences in the quality of general-verbal intelligence. It is customary to standardise test results to a mean of 100 and a standard deviation of 15. If this is done—that is, to an I.Q. basis—we obtain results similar to those in Table 16.

TABLE 16

Standardised score to an I.Q. basis	Percentage of children within this group	Description	Approximately suitable secondary and higher education
145 and over	·2	Exceptionally bright	Universities and higher education
130-144	1·8	Very bright	[1]Grammar schools, technical schools and technical colleges, universities
115-129	10	Bright	
100-114	38	Average	Secondary modern schools
85-99	38		
70-84	10	[2]Dull and backward	Special class in secondary modern school
55-69	1·8	Mentally deficient	Schools for Educationally Subnormal (E.S.N.)
below 55	·2	Idiots	Institutions (ineducable in the ordinary sense)

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[1] The pupils for grammar and technical schools are paired here, but the method of selection of pupils for these schools varies considerably (see Ch. XVI).

[2] Sometimes the backward child is said to be one whose attainment quotient is below 80 (see *Reading Ability*, H.M.S.O. pamphlet).

Table 17 gives some typical statistics obtained by testing the 10-11 year old primary school population of an industrial borough in the North of England. The scores are I.Q. scores. The children were tested on two occasions, using similar but not identical tests, the second following four weeks after the first. This table does not include data from children in special schools. The correlation coefficient between the two sets of test results is ·94, and this gives a measure of the overall constancy between individual *pairs* of scores. The mean improvement of three points of I.Q. (101-98) is attributable to practice effect.

TABLE 17

	60	70-	80-	90-	100-	110-	120-	130-	140+	Mean score
1st Test .	38	156	275	378	384	243	99	19	1	98
2nd Test .	24	128	234	371	329	289	169	46	3	101

It does not follow that the exceptionally bright child will become a Newton, Goethe, Shelley, or Galton. Many other conditions have to be fulfilled. The child would need zeal, energy and opportunity. Very brilliant children may tend to become isolated, particularly if they have poor or restricted home backgrounds. Their vocabulary and thought is on a different plane from that of their relations and intimates. The ideal conditions for a brilliant child are that his home and surroundings should be cultured and intellectually stimulating. Galton was such a child for he enjoyed a stimulating and intellectual background at home. Conditions were nearly ideal for him.

The fact that individual differences in g-v intelligence vary so widely has several important implications for educational practice. First, it points to the need for small classes. Also when the child reaches 11+ it is advisable to stream classes because the individual differences in I.Q. scores when expressed as mental ages can be very wide indeed.

$$\text{M.A.} = \frac{\text{I.Q.} \times \text{C.A.}}{100}$$

At 9 years of age (C.A.) the differences in M.A. between children of I.Q. 90 and 120 is equal to 2·7 years (10·8—8·1). This is large enough. But if the same children were 14 years old the difference in mental age would be 4·2 years!

At the age of 11, on average, girls are noticeably superior to boys in verbal test scores. When expressed in points of I.Q. the difference may be as high as 3-4 points.[1] Here are some statistics showing the mean scores of boys and girls in different schools. This table also demonstrates very convincingly the variation between schools, a fact which has to be taken into account when allocation to secondary schools is made on the basis of internal marks in the primary schools.

TABLE 18

Showing School and Sex Differences

School	Mean I.Q. of boys	Mean I.Q. of girls
a	89	90
b	93	103
c	98	94
d	109	111
e	103	102
f	108	104
g	97	104
h	103	107
i	95	97
j	100	105
k	93	100
l	98	101
m	106	104
n	95	96
o	93	93
	$m_B = 98$	$m_G = 101$

Boys' non-verbal scores are *slightly* superior to girls'; the difference is of the order of one point of I.Q.

(iii) *Aptitudes*

When the psychologist speaks of an aptitude he has in mind the potentiality a person has to succeed in an occupation or school attainment. The psychologist devises tests to discover in advance whether a person has an aptitude for learning foreign languages or for engineering. The aptitudes which interest us most at the end of the primary school years are those for the different kinds of secondary education or the different biases possible as a pupil progresses through a comprehensive school. It is primarily a question of aptitudes, on the one hand, for academic, abstract and bookish education and, on the other, for practical, constructive, creative, technical education. (See the Norwood Report, pp. 2-4.) [1]

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[1] As they pass through adolescence the boys gradually overtake and pass the girls. The girls' superiority was more marked during the years immediately following the Second World War.

Clearly the problem of variations (from individual to individual) in these aptitudes relates to the similar problem of variation in the *quality* of intelligence, which we have just discussed in the previous section. Are these individual differences so marked as to justify our view that the aptitudes for the two broad fields of study really exist? The answer is affirmative on the whole. The tests and other situations designed to measure the aptitudes correlate very significantly with the later measure of attainment in the grammar or technical school subjects.

This measure is called the *criterion*, and the correlation between aptitude tests and the criterion gives the *predictive power* of the tests. The choice of a criterion whether of success in a grammar or technical school, presents some difficulty. For instance, we usually make use of examination results, but a child may profit more from a secondary school than his success in school examinations reveals. For all that, success in examinations during and at the end of school ranks very high in the pupils', parents', teachers' and employers' opinion of what constitutes secondary school progress. For that reason most workers have used yearly examination results in follow-up studies, whilst a few have given the prediction a more searching test by using School Certificate results obtained five years after the entry examination. More use is now made of teachers' assessments, usually on a five or fifteen point scale, particularly in the case of technical school criteria, where assessments for such composite tasks as woodwork, metalwork and engineering drawing are involved. Such estimates have to be discussed carefully to avoid unwanted 'halos'. Generally the fuller and richer the criterion the less objective it is. The simple compromise seems to lie in the five or fifteen point scale, preliminary discussion of the scale, and the choice of concrete examples to illustrate the criterion, for the benefit of those required to make the assessments.

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[1] Cutting across this classification we have grouping according to the *quantity* of intelligence which each child has. This decides whether a child is fit for grammar (and technical) school or a secondary modern school.

But the difficulties are not ended even if a successful compromise has been reached in one school. In most researches more than one secondary school is involved and so we have the problem of reaching a common scale. It is customary to scale on objective tests, but this procedure may be criticised in research where objective test results are being assessed against a graded scale. The graded scale can also be applied to less tangible features of the secondary pupil's development—his emotional and social reactions to school life, his interests and aptitudes—which form a considerable part of his 'profit' in the secondary school.

We may now try to answer the question as to how far the aptitude for grammar and technical school subjects may be predicted. There is much evidence on the prediction of grammar school success. McClelland's work[1] referred to Scottish secondary schools; Peel and Rutter and Emmett and Wilmut showed that performance in School Certificate subjects was highly predicted by predictive tests of intelligence, English and arithmetic, taken five years previously. On the whole individual differences in arithmetic tests are not so highly related to later differences in secondary school mathematics as English and intelligence tests are to Arts subjects.

Evidence relating to technical school aptitudes is not so extensive, but correlations have been obtained which are comparable with those for grammar school subjects. Peel,[1] Lambert,[1] Watts and Slater[1] all confirm that aptitude for technical drawing, woodwork and metalwork can be predicted by tests. Work carried out at Birmingham University shows that aptitudes for engineering drawing, practical geometry and building subjects can be similarly predicted.[2]

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[1] See Reading List

[2] Pal, A. K., *A Psychometric Study of Engineering and Architectural Drawing*, Unpublished Ph.D. thesis, Birmingham 1953

(iv) *Attainments*

Individuals differ widely in school attainments with respect both to quality and quantity. These attainments are the products of complex causes, and abilities, interests and opportunity all make for variety in the range of a child's attainments. In the primary school the 9-11 year old may achieve a wide range of attainments and skills in number, writing, reading, appreciation (of poetry and art), art and craft, history and geography. It is unfortunate that the interest we have shown in the past in attainment in the barest 'core' subjects of the three Rs has itself limited the children's opportunity for enriching their experience and making the widest use of their powers. This tendency has been further aggravated by the objective test methods used to evaluate attainment in arithmetic and English, for these methods tend to be reflected in current teaching practice.

When the pupil passes to the secondary school we assume that the richer the curriculum the better. It is particularly important to apply this principle fully in the curriculum of the secondary modern school.

There are secondary schools where every effort is made to widen and enrich the pupils' experience. There is, for example, a school I know, which is technically a bilateral school (grammar and technical) but which is in effect a single school offering a common core of teaching in science, arts, technical and craft subjects. As the pupils go through the school they gradually take up the particular bias which interests them but preserve right through to the sixth form some contact with the other options.

With respect to individual differences in quantity of attainment, we have the most trustworthy evidence from tests of English and arithmetic. The range of attainment in these subjects is very wide.

Objective tests of English, containing about one hundred items testing spelling, vocabulary, usage, comprehension and punctuation, yield mean scores of some 40-50 correct answers when given to complete 11+ age groups. The standard deviation is usually of the order of 20.

Similar figures are obtained from one-hundred-item arithmetic tests, in which the four rules in number, money, weight, time and length, and simple problems are tested. Very often the standard deviation of arithmetic scores may be a little higher.

These statistics ($m = 40\text{-}50$, $\sigma = 20$) represent a very wide variation between individuals.

There are also wide differences between the pupils' achievements in English composition. The following extracts taken from the compositions written by a complete age group of 10-11 year old boys, illustrate this variation very clearly. The children were asked to continue an illustrated story of two children who sheltered in a seaside cave and discovered a box half-buried in the sand. I have also given each boy's intelligence quotient and English quotient, as measured by objective tests of intelligence and English.

Boy A (*I.Q.* 140+ *E.Q.* 140+)

Shining the torch over the sand, they came upon a small box. They cautiously opened it, and when they got over their surprise at seeing all the valuable jewels, Tom, after showing his sister a diamond, and some large gold coins, said, " Are you coming to the coastguard station with me ? "

Boy B (*I.Q.* 124 *E.Q.* 118)

At the other end it was very sandy with scraps of wood and sea weed littered about. " Come on lets have a game " I said. For a time we made sand castles and such like things.
" I know lets dig a deep hole " Pam said brightly

" A good idear " I replied. For five or sixs minuts we dug down.

Boy C (*I.Q.* 109 *E.Q.* 96)

It was rather a long cave. Betty and Jim rushed into the cave to explore. Now it was raining fast outside has Betty runing along she tirp up pn a box. Then Jim came and helped Betty up. Just then Betty said " let's pull it up.

When it was out of the sand, Jim said " it an old smarglars chest."

Boy D (*I.Q.* 87 *E.Q.* 87)

Sudenle they came to a cave and Barry said let's go in here, Thy walk a bit father and thy saw a cast and Barry said lets pull it up and see whats inside and they found jewels, and perles and they lived aple ever after.

Boy E (*I.Q.* 78 *E.Q.* 78)

Once their was to twins. they was playing at the sea side. and it started to rain so they went in a cave. and the boy said what in this and Betty said lets pull it ap. That is how they found the Treasure.

It is not necessary to labour the individual differences in expressive power, usage, vocabulary, spelling and punctuation which are revealed in these five extracts.

The reader may consult Burt's *Mental and Scholastic Tests* for further examples of individual differences in school attainments.

(v) *Interests*

Any topics which interest a child are of significance in his education, but two fields of his interests are of particular value : the school subjects he likes best and the leisure activities which most interest him. Among interests in school subjects, those marking off academic or bookish interests from practical and non-literary interests may be of assistance in the allocation of pupils to secondary schools.

First I want to discuss the academic and practical interests of children in their last year at the primary school. Lambert [1] and Peel [2] devised a method for assessing relative interest in these two 'opposing' fields. This makes use of information and vocabulary tests. Each sub-test consists of six items of equal difficulty, three practical, three academic. The testee is instructed to answer three only of the six and in this way, by scoring his total practical and academic responses separately, we are able to obtain a measure of the bias of his practical or academic interest. A vocabulary sub-test is as follows.

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[1] Lambert, C. M., 'A Survey of Ability and Interest at the Age of Transfer' *B.J. Ed., Psych.* XIX, 1949

[2] Peel, E. A., 'Assessment of Interest in Practical Topics' *B.J. Ed. Psych.* XVIII, p. 41, Feb. 1948

Select three of the six words below and write their meaning.

(1) Tenon saw (use words and make a drawing)
(2) Parable
(3) Dovetail joint (use words and make a drawing)
(4) Architect
(5) Duet
(6) Coal tender

We may define practical bias or interest by the expression

$$\frac{100\ (P-A)}{100\ (P+A)}$$

When 11-year-old boys from the top 30 per cent. of the ability range in Northumberland were tested, their mean bias was $-26{\cdot}4$ with a standard deviation of 31·8. This represents a wide range of interest, -96 to $+55$. One-fifth of the boys had a positive practical bias of interest, although of course the mean interest score partly depends on the items used in the test. It may be that the results of primary school teaching, with its slant towards book learning, favour an academic response to our interest test. Later[1] we confirmed these results. When we compared boys who later went into grammar schools with those who were allocated to secondary modern schools, we found that the grammar school boys had significantly higher academic interests before entering the grammar school than their primary school classmates who later went into modern schools.

Pennington[2] applied the same technique to investigate boys' leisure time interests which he classified under three headings as active (A), passive (P) and intellectual (I). He devised vocabulary tests, opposing pairs of these three fields of interest in rotation. His results demonstrated clear-cut individual differences which relate interestingly to the schools which the boys were attending. The mean bias of interest of various forms and classes of boys is reproduced in Table 19.

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[1] Unpublished research carried out in conjunction with the West Riding Authority

[2] Pennington, A., 'A Study of Leisure Interests in Schoolboys' *Research Review* I, 1950

TABLE 19

Showing leisure time activities with mean bias of interest towards the first of each pair

School	Stream	Interest		
		I *v* A	I *v* P	A *v* P
Town grammar—				
Form A	1	12	−3	1
Form B	2	4	0	3
Rural grammar . . .		−1	6	8
Secondary modern . .	a	−9	−7	−14
	b	−16	−19	−22
	c	−25	−44	−20
	d	−11	−48	−28

These differences are suggestive, and the entire problem of practical *versus* academic interests and of leisure time interests is receiving further attention. The interests of students are also being investigated along similar lines. These seem to suggest three main groups of more mature interests: (i) active, scientific and trivial; (ii) literary, artistic and musical; (iii) political, historical and religious.

In his investigation of the tone, morale, attitudes and interests of pupils in comprehensive schools, Miller [1] also made use of the above technique to contrast active with passive interests. He compared his four groups of pupils, those attending grammar schools, modern schools, and the two comprehensive groups, the abler and less able, and obtained the following results, where a minus sign indicates passive interests.

TABLE 20

	No.	Mean Scores	Range	Differences		Sig.
Grammar . .	174	−3·66	−71 to 65	GS-CG,	3·44	no
Comprehensive (G) .	132	−0·22	−56 to 85	GS-MS,	−21·02	0·01
Comprehensive (M)	217	−14·63	−84 to 72	CG-CM,	14·41	0·01
Modern . . .	224	−24·68	−84 to 56	CM-MS,	−10·05	0·01

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[1] Miller, T. W. G., Values in the Comprehensive School. *Educ. Monog.* No. 5, University of Birmingham School of Education, 1961

We may note in passing that the comprehensive abler pupils have interests slightly more active than the grammar group and that the less able pupils in the comprehensive schools have more active interests than their peers in modern schools.

A further way of testing interests is by making use of *homonyms*.[1] Such words as *strut*, *span*, *fret*, *brace*, *tie*, *tender* and *spring* have both practical and non-practical meanings. If these words are presented to 10-11 year old pupils as a vocabulary test, their interests are revealed by the meaning they give to the word. Only rarely does a child give two answers to a word and 'jokers', such as *detain* and *portrait*, were interspersed in the test in order to obscure its real nature.

The test was applied to pupils in four secondary modern schools and the practical interest scores compared with sex and age. Differences due to sex were very marked, boys being much more practically minded than girls. This in a way is good evidence for the validity of the test. Differences due to age were, statistically, significant, but not so significant as in the case of sex. Older children tended to have larger practical interest scores. Such a tendency shown in modern school children might be judged as also supporting the validity of the test.

From these researches it is clear that individual differences can be detected in the broad fields of practical and non-practical interests. A knowledge of these interests could be used to supplement the data about abilities and attainments used for allocation to secondary schools and vocational guidance.

The work on leisure interests is also suggestive and supplements the findings from the material gathered by Wall and Jenkinson [2] in connection with the leisure reading interests of school pupils and their film interests.

(vi) *Conclusions*

We have outlined the principal differences which characterise pupils' abilities, aptitudes, attainments and interests.

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[1] Peel, E. A., 'Assessment of Children's Interests' *Educ. Rev.* Vol. 4, No. 2, p. 164, 1952
Peel, E. A., The Measurement of Interests by Verbal Methods. *Brit. J. Stat. Psychol.*, XII, Pt. II, 1959

[2] See Reading List

Clear-cut differences in intellectual ability are discernible in general intelligence, verbal intelligence and spatial-practical intelligence. Similarly, at 11 years of age, two broad aptitudes are discernible—an aptitude for academic, bookish learning, and an aptitude for visual-practical-mechanical attainments.

The important differences in attainment concern English, arithmetic and English composition. In all three cases individual differences can be clearly demonstrated by tests and examinations.

The testing of interests has not progressed as far, but information and vocabulary tests allowing a choice between two fields of interest enable us to distinguish between practical and academic interests and between leisure time intellectual, passive and active interests.

All this information may be used for allocation and guidance. In Chapter XV we discuss examinations, and in Chapter XVI the topic of school records and the methods by which we collate and apply the information about individual differences.

(vii) *Reading List*

VERNON, P. E. *Structure of Human Abilities*, Chs. IV, VI, VIII and X (Methuen, London).

ANASTASI, A. and FOLEY, J. P. *Differential Psychology*, Pt. II (Macmillan, New York).

MCCLELLAND, W. *Selection for Secondary Education*, Scot. Coun. Res. Ed. (U.L.P., London).

PEEL, E. A. and RUTTER, D. 'The Predictive Value of the Entrance Examination', *B.J. Ed. Psych.* XXI, p. 30, Feb. 1951.

EMMETT, W. G. and WILMUT, F. S. 'The Prediction of School Certificate Performance', *B.J. Ed. Psych.* XXII, p. 52, Feb. 1952.

PEEL, E. A. 'Selection for Technical Education', *Educ. Rev.* Vol. 4, No. 3, 1952.

BURT, C. *Mental and Scholastic Tests* (Staples, London).

PEEL, E. A. 'Assessment of Interest in Practical Topics', *B.J. Ed. Psych.* XVIII, p. 41, Feb. 1948.

LAMBERT, C. M. 'A Survey of Ability and Interest at the Age of Transfer', *B.J. Ed. Psych.* XIX, p. 57, 1949.

WATTS, A. and SLATER, P. *Allocation of Primary School Leavers to Courses of Secondary Education*, N.F.E.R. Pt. III (Newnes, London).

PENNINGTON, A. 'A Study of Leisure Interests in Schoolboys', *Research Review*, I, 1950.

Wall, W. D. 'The Adolescent and the Cinema', Pts. I and II, *Educ. Rev.* Vol. 1, No. 1, 1948, No. 2, 1949.

Valentine, C. W. *Psychology and Its Bearing on Education*, Chs. XXXII-XXXIV (Methuen, London, 1950).

Wall, W. D. 'The Newspaper Reading of Adolescents and Adults', *B.J. Ed. Psych.* XVIII, 1948, Pts. I and II.

Wall, W. D. *The Adolescent Child* (Methuen, London).

Jenkinson, A. J. *What do Boys and Girls Read?* (Methuen, London).

Fryer, D. *The Measurement of Interests* (Holt, New York).

Fleming, C. M., Lambert, C. M., Burt, C., Peel, E. A., Pringle, M. L. K. and Wall, W. D. 'Mental and Diagnostic Testing', *Educ. Rev.* Vol. 4, No. 2, p. 145, 1952.

Peel, E. A. 'The Measurement of Interests by Verbal methods', *Brit. J. Stat. Psychol.* XII, Pt. II, 1959.

Miller, T. W. G. 'Values in the Comprehensive School', *Educ. Monog.* No.5, 1961. Univ. Birmingham Inst. Education.

(viii) *Exercises*

1. Give a standardised objective test of arithmetic *or* English to your class and note the range of the individual differences.

2. Set your class a composition examination and rank the compositions in order of merit. Use the overall impression method of marking. Grade them according to the rough scale suggested on pages 193-4.

3. Prepare and apply a questionnaire designed to obtain a measure of your pupils' leisure interests.

4. Give 10 examples of words and 10 pieces of information you could make use of in order to test a 22-year-old pupil's interest in trains. Try out your test on a class of pupils to determine the average range of interest.

5. What vocabulary might you use to test the interests of an 18-year-old applicant for a training college in, say (*a*) music, (*b*) art, (*c*) current affairs? Give 20 examples for each interest.

CHAPTER X

INTELLECTUAL DEVELOPMENT

(i) *Development in altitude of intelligence* (ii) *Development in breadth of intelligence* (iii) *Development in attainment* (iv) *Reading list* (v) *Exercises*

(i) *Development in Altitude of Intelligence*

(*a*) *Theory and Results*

As a person passes through childhood and adolescence he becomes able to carry out increasingly complicated tasks. He takes on more difficult calculations in arithmetic and is able to understand and put together more complex sentences in English. In any intellectual activity, reading, arithmetical calculations, comprehension, reasoning or memory, his powers may be said to develop in *altitude*. This term was first introduced by Thorndike and is one way of defining the *quantity* of intelligence. I propose to extend the concept of altitude to include the idea of change in the *quality* of thinking as shown in Piaget's researches which I have discussed elsewhere.[1] There is a change in intellectual quality when a pupil explains a phenomenon in terms of other ideas and experiences (as opposed to merely describing it). Such changes are a feature of intellectual development up to and during adolescence.[2]

The *rate* at which the child's intellectual level increases will now be considered. If we examine the items of Form L of the Terman-Merrill [3] revision of the Binet test we obtain some interesting information on how the level of performance of relatively simple intellectual tasks increases. Thus in the picture vocabulary test, where the child has to name the objects shown to him in a picture, we have the following 'pass' scores at various ages.

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[1] Peel, E. A., *The Pupil's Thinking* (Oldbourne Press, 1967)

[2] Peel, E. A., 'Intellectual Growth During Adolescence', *Educ. Rev.*, *17*, 3, 1965

[3] Terman, L. M. and Merrill, M. A., *Measuring Intelligence* (Harrap, London)

TABLE 21

Ages (yrs : mths) . .	2 : 0	2 : 6	3 : 0	3 : 6	4 : 0
No. of objects named . .	2+	9+	12+	15+	16+

The vocabulary of the older child is tested by asking him to give the meaning of words which are called out to him. The list begins with the words *orange, envelope, straw, puddle.* The scoring standards at various ages are as follows.

TABLE 22

Age .	6	7	10	12	13	Superior adult
Score .	5+	8+	11+	14+	16+	20+

In the case of immediate memory for numbers we have the following levels for repeating digits after they have been called out.

TABLE 23

Age . .	2 : 6	3 : 0	4 : 6	7 : 0	9 : 0	10 : 0	12 : 0	Sup. adult
No of digits repeated correctly	2	3	4	5	4*	6	5*	9

* Here the digits have to be given in reverse order.

The reader may also find out for himself, by examining the Terman-Merrill test, how immediate memory for sentences gradually increases from the correct repetition by a four-year-old of such a sentence as, '*John likes to take his small sister to the park*', to, '*In the mountains the farmers get up early to milk the cows on the high pastures*', for a child of 11 years of age.

We have already seen that the ability to reason is an important component of intelligent behaviour (Ch. VIII) and that the ability to discover relations is an essential part of reasoning. The simple analogy, black : white : : up : ?, and the simple series, 1 4 9 16 ? ? are solved by discovering the relations between the words and numbers. They constitute very elementary reasoning tests. The differences between such simple relation tests and the more complicated reasoning of formal logic, advanced mathematics and other forms of higher thinking may be only those of complexity. Readers of novels on crime detection can verify that this is largely so if they try to make use of the clues supplied in the novels of Agatha Christie and Dorothy L. Sayers.

The Binet test makes use of simple relations such as identifying an object by its use (for 2-year-olds), verbal analogies (for children of 5½ years of age), pictorial and verbal absurdities, similarities and opposites, and detection of facts from presented evidence. The last named is a test for 13-year-olds and makes use of a situation strongly resembling those seen in the good crime detection novel. The pictorial absurdities test consists of a picture depicting wrong relations. One shows a man walking in a shower of rain and holding his umbrella in the wrong direction. An example of the verbal absurdity is the following, taken from Form L.

> In an old graveyard in Spain they have discovered a small skull, which they believe to be that of Christopher Columbus when he was about 10 years old.

Binet utilised a child's description of the contents in a picture to test his capacity to understand more complicated relations and finally to make inferences about the people in the picture. Formerly it was assumed that a young child (at about four years of age) would merely enumerate the items seen in the picture and that a little later (at six years) he would note the actions of people. Relation finding is very rudimentary at this stage, but between seven and nine years of age the 'describer' stage is reached, when the child describes spatial and numerical relations between the items of the picture. If the picture is coloured he may also note the colours. Still later he begins to make inferences for he may describe *temporal* relations. These are elementary inferences since the picture shows what is happening in one instant of time only. Soon after this the child may begin to list *causal* relations, such as why people in the picture are carrying out the actions depicted. This last stage, called the 'interpreter' stage, was supposed not to be developed until the age of twelve and upwards. Much less is made of these qualitative differences in the Terman-Merrill revision, and the users of the test are told to expect all kinds of responses at all ages.

The absurdity test is not the best test of reasoning, for most testees, particularly children, assume the good faith of the tester and do not expect nonsense or other irrelevant tricks which enter into an absurdity test. On account of the irrelevant elements in the absurdities test, it is not now used so much in new reasoning material.

Burt emphasises in Appendix III to the Hadow Report that the changes in reasoning ability with age are mainly those of complexity. Isaacs also held a similar view. The child proceeds from simple relation finding to grasping relations between relations. There are several apples of different sizes and hues of green and red before a child. An example of the simplest relation finding would be to ask the child to select either the larger of any pair or the riper (redder) of any pair. Relations of size would have to be co-ordinated and related to each other if the child were then asked to put all the apples in order of size, but the relations would be even more complicated if we asked the child to select, say, the largest red apple or the smallest green apple. At the higher levels of relation finding the child must be able to ' analyse out a fairly complex presentation, and to grasp its organisation as a system of logically presented ideas '. Burt states that a child of seven can be taught to reason in number, particularly if the facts of arithmetic are presented as discoveries by the child rather than in ready-made tables.

Piaget[1] holds a somewhat similar view to Burt's but he stresses more the discrete phases in the development from primitive to formal reasoning. He attributes fairly well-defined age ranges to three phases, in the development of reasoning. The stages are called *intuitive, concrete* and *formal.* In the *intuitive* stage the child is able to grasp only a single relationship at a time which must relate to concrete material. So we have the four-year-old child who is asked to arrange a series of sticks, A, B, C, D, E, in order of length. The child can say which of any pair of sticks is the larger or smaller, so he may say that $B > A$, $C < A$, or $D > E$, but he cannot proceed from the first pair, $B > A$, $A > C$, to $B > A > C$ by which he would *serialise* the sticks. A single relation grasped at any time appears to inhibit or obstruct the co-ordination or formation of further *relations between relations*.

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[1] Piaget, J., *The Psychology of Intelligence* (Routledge, Kegan Paul, London)

The colour drawing by a 5½-year-old child, reproduced in black and white as Figure 33, illustrates a similar inability to co-ordinate relations. The heads and shoulders of the figures are in a correct relation, as are the feet of the two figures, but the *head* and *feet* of the man are incorrectly related.

Between the ages of five and eight the child develops the capacity to combine simple relations between concrete objects, and the example of serialising sticks of different lengths would be managed without difficulty. This is the *concrete* stage of reasoning, for Piaget maintains that, although the five to eight year old can cope with practical problems, he would be unable to solve an abstract or formal problem such as the following.

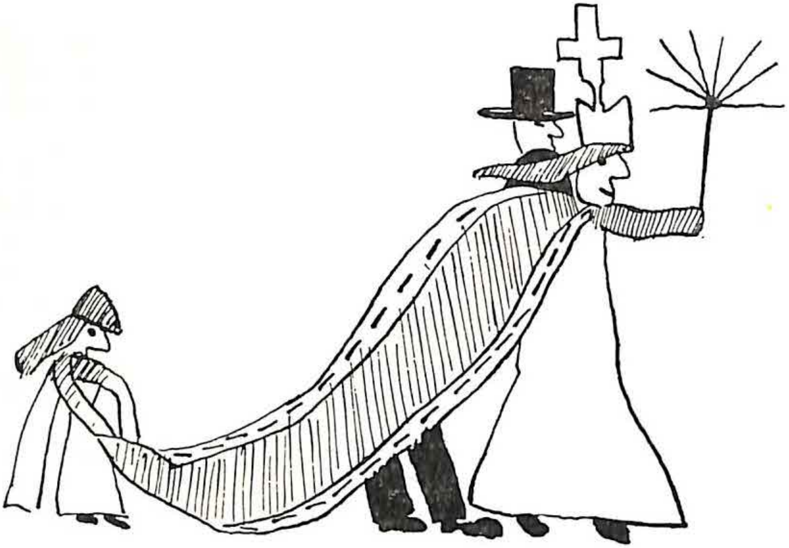

FIG. 33. 'The Coronation'

> Edith is fairer than Susan ; Edith is darker than Lily. Who is the darkest of the three ?

Piaget contends that the eight-year-old reasons *formally* as the four-year-old reasons in *concrete* material, that is, he is able to grasp single formal relationships but is not able to co-ordinate them. So we might have the following attempt at solution.

> Edith and Susan are fair (single relation), Edith and Lily are dark (single relation), therefore Lily is the darkest and Susan the fairest.

Not until a child reaches the age of twelve is he able to solve this kind of problem when he begins to 'accomplish with formal problems what he could do with concrete problems at 8'.

At this stage, the *formal*, the premises are given as verbal postulates, and the conclusion is drawn formally without recourse to concrete operations.

The close similarity between Burt and Piaget is quite clear. Most British educational psychologists would differ from Piaget when he assigns definite age ranges to each of the stages.

In a more recent work[1] Piaget describes a long series of experiments on the development of arithmetical concepts in the child and of his ability to grasp number relationships. He takes first the problem of *conservation*. How does the child arrive at his belief in conservation of material? This is investigated by such experiments as the following.

(i) A quantity of liquid is poured by the child from one container to another vessel which is narrower and taller. The child is asked whether the liquid has changed or remained the same in quantity.

(ii) Beads are transferred one at a time from one container to one of different shape and dimensions. Has the number of beads changed or remained the same?

Piaget suggests that there are three stages in the child's progress from a belief that the liquid or the number of beads has changed to a certain belief that the liquid and beads have remained the same. The first of these stages he calls *global*, in which there is no evidence of real quantitative analysis. The child is quite firm that the quantity has changed and refers the experimenter to the change in level, and so on. His judgment is global because it refers to the overall appearance of the change. Then the child passes to the *intuitive* stage in which he may be convinced that no change has taken place only when the relations between the containers are simple or when, in the second case, the counting process is emphasised. But if the conditions are altered then the child is again deceived and believes the quantities have changed. At this stage there is evidence of real analysis of the problem at the perceptual level, but if conditions are varied so that the perception becomes more difficult, then the child fails to ' perceive ' the unchanging quality of the material.

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[1] Piaget, J., *The Child's Conception of Number* (Routledge, Kegan Paul, London)

This second stage is perhaps better illustrated by taking one of Piaget's later experiments which he used to test the child's powers to *correlate two classes*. In one such experiment the child is asked to put a flower into each of six vases. The flowers are then laid on the table. It often happens in this intermediate phase that as long as the flowers are spread out over the same distance as the line of vases then the child will say that there are as many flowers as vases. If, however, the line of flowers is spread out very widely, the child may judge that there are more flowers than vases ; if they are put in a bunch together, that there are fewer. This demonstrates what Piaget means by real analysis at the perceptual level.

The third stage is called *operational*, and here the child's grasp of the unchanging quality of the liquid has become purely intellectual and independent of the accidence of spatial and material limitations. To refer back to the three examples mentioned, in the case of the first two, the liquid and the beads are not judged to have changed in quantity, no matter how different the shapes of the containers ; and in the third case, once the child has counted the number of vases and the number of flowers, then no matter what is done to the flowers, as long as they still exist, the child is convinced that their number is equal to that of the vases.

Operations are actions which can be carried out in thought, such as adding a number of red and blue beads. They are also reversible. So the total number of beads can be re-grouped into a set of red beads and a set of blue beads. They are also capable of being organised into structured wholes and one tested for inconsistency with others. Piaget tells us [1] that there are 'four main stages in the construction of operations, and these extend over the period from birth to maturity'. These sum up his overall theory and remove the ambiguity introduced by the over-lapping terms *intuitive* (p. 203) and *global* (p. 206).

First, there is the *sensori-motor period* (0-2 years), when the child can only perform motor actions. He has no language and has only limited thought. So an object exists only when in sight. A very young child does not lift off a handkerchief that covers a watch he has already seen. He withdraws his hand. But as his spatial field is organised by co-ordination and reversing of actions, so the 'construction of the permanent object' is brought about. This is the first of the 'invariants' which play so large a part in his later reasoning.

Secondly, there is the stage of *pre-operational thought* (2-7 years), when actions can be 'internalised' into thoughts. Language and symbolic play make this possible. The field in which the child can exercise his powers becomes greatly enlarged beyond his immediate spatial environment to include the past and distant. But he is still unable to translate some actions into thought. He is able to 'co-ordinate his movements from place to place (when he walks about the room or in the garden) into a group, as well as when he turns objects round', but a long period will elapse before 'he will be able to represent them precisely in thought'.

There is an absence of reversible operations that is shown when the child pours water into a different shaped glass and believes that the *quantity* of water has changed.

Intuitive thinking, mentioned in connection with intelligence, and global thinking in arithmetic, are equivalent to pre-operational thinking.

The third stage consists of *concrete operations* (7-11 years) and we have outlined its essentials earlier in this chapter. Here the child can perform the operations of concrete objects, *classification*, *seriation* and *correlation* of concrete objects.

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[1] Piaget, J., *Logic and Psychology* (Manchester University Press)

But these operations are fragmentary and have not been combined into a structural whole. This course is the last stage when the child is capable of carrying out *propositional* or *formal operations*. He no longer judges statements in terms of their data, but, accepting the data, examines the statements for inconsistencies. Thus in the absurdity quoted on page 202 children at the concrete stage will criticise the *data* in the statement by such remarks as, ' They should not dig up graveyards '. On the other hand when the absurdity is detected correctly it is done propositionally. The difference between a ' fragmentary ' and a completely ' structured ' solution is shown very frequently in the errors made in algebra. Here are two examples.

$$\frac{1}{b}+\frac{1}{d}=\frac{2}{bd}$$

$$\frac{a}{b}+\frac{2}{b+c}=\frac{a(b+c)+2b}{b(b+c)}=a+2$$

Piaget reminds his readers that formal operations are not restricted to verbal material. The difference between haphazard variation of the variables all at one time in a physics experiment on the swing of a pendulum and the systematic examination of the correspondence of each pair of variables at a time illustrates the difference between *concrete* and *propositional* operations.

Enlightened classroom teaching of science and mathematics also proceeds in a similar sequence. In the teaching of geometry, for example, it is now an established practice to make use of the learners' intuitions in the earlier stages of learning and only to move on to the more rigorous methods of formal geometry when the intuitions and perceptions of the child have been thoroughly systematised. We should also note that even in learning at a much more advanced level, as in scientific and mathematical research, the initial discovery often takes place at an intuitive level. The reader should consult Wertheimer[1] on this point. Of course, when the discovery is written up for a scientific journal, then it is presented in terms of rigorous formal operations.

(*b*) *Gestalt Contributions to the Problem of Thinking*

In addition to Wertheimer's work on productive thinking there is also the suggestive series of researches carried out by the gestalt psychologist Duncker[2] on problem solving.

Duncker gave different problems to university undergraduates including the following :

> Given a human being with an inoperable stomach tumour and rays which destroy organic tissue at sufficient intensity, by what procedure can one free him of the tumour by these rays and at the same time avoid destroying the healthy tissue which surrounds it ?

and

> Why are all the six-place numbers of the form 276,276, 591,591 and 112,112 divisible by 13 ?

The students were asked to ' think out loud ' and to include all the attempts they made at the solution of these problems.

Duncker was concerned with the way in which insights are structured and in particular with the ' direction ' of a solution. As a result of his analysis of the students' answers, he was able to lay down certain canons.

The solution of a problem is reached by a succession of reformulations of the original statement. These reformulations become less general, more specific and more relevant to the final solution as progress is made.

Each one of these phases possesses in retrospect the character of a solution and in prospect that of a problem.

Solution of a problem does not follow one line only. In the early stages wrong lines may be taken up which are followed until the specific formulations are clearly wrong when a jump or transition is made to a fresh line. So in the tumour problem, wrong initial lines are

(1) avoiding contact between rays and healthy tissue

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[1] Wertheimer, M., *Productive Thinking* (Harper, New York)

[2] Duncker, K., ' On Problem Solving ' *Psychol. Mon.* 58.5, 1945

(2) desensitizing the healthy tissue.

These lead to wrong specific solutions, and a transition or jump is made to

(3) lowering the intensity of the rays on their way through healthy tissue

which can lead ultimately to the correct solution.

In a later series of experiments on problem solving in *practical* situations, Duncker reveals how the components to be used influence solution according to whether they are seen as ' conflict ' or ' solution ' material.

> 'We experimented with all sorts of objects in daily use (*e.g.* boxes, pliers, etc.), which were first claimed in their usual function and then, within the same problem-situation, for a new, unusual function. The crucial object was each time to be selected as the suitable tool out of a great number of objects which lay in confusion on a table.' [1]

Correct solutions were reached much more numerously in the second case.

Duncker's work and its relation to other research by associationists and gestalt theorists is discussed very comprehensively in Humphrey's book on *Thinking*.[2]

(*c*) *How long does the individual's intellectual power continue to increase ?* Is there a point when the individual's powers cease to improve and later may begin to deteriorate ?

There are two ways of obtaining this information. A test may be given to various age groups of children and then the average scores for all groups compared on the assumption that the composition of the different groups remains unchanged. When we compare ages which are widely scattered over childhood and adolescence, the populations tend to become more selected at the higher ages. Furthermore, even if the populations are all random or similar, the older people may have had quite differing schooling from the younger children. The other way is by follow-up studies on the same children. These are called longitudinal studies. Their chief disadvantage is that they take many years to complete and it is difficult to keep in touch with all the individuals tested in the first place.

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[1] See Duncker, K., p. 86

[2] Humphrey, G., *Thinking* (Methuen, London)

In the early twenties there was some confusion as to the age at which mental growth ceased. Popular belief held that intelligence goes on growing steadily into adult years. Then, as a result of Terman's enquiries, 16 years was taken to be the age at which normal mental growth stops. Now, however, although we recognise that the most rapid growth is between 9 and 18, the usually accepted age is about 20. But even at this age there is evidence that mental growth may still continue at a very slow rate. The graph obtained by Dearborn and Rothney (3rd Harvard Group Study) [1] gives us a picture of the change of mental power with age.

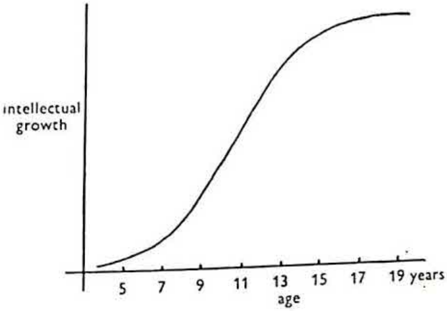

FIG. 34

When boys and girls are compared for their relative performances in verbal material, the girls begin to take the lead at 7 or 8 and hold it until late adolescence, after which the boys overtake the girls. In the case of weaker individuals the age at which mental growth stops may be much less than 20.

When performance in tasks of different difficulty are plotted against age, the following types of curves are obtained.

It will be noticed that the gradients of these curves and those in Figure 34 reach their largest value in the middle school years. Over this period they are sensibly straight. This fact is made use of in some methods of standardising tests.[2]

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[1] See Anastasi, A., and Foley, J. P., *op. cit.* Ch. 9

[2] See Ch. VIII

Cross-sectional studies on adults show that intellectual growth ceases to increase after the early twenties and soon after begins to deteriorate. Investigations by Wechsler, Miles, Jones and Conrad,[1] and Raven all demonstrate the diminution in intellectual power that begins at about thirty years of age.

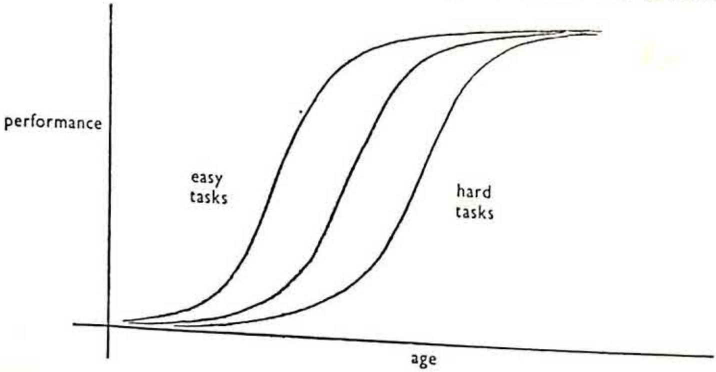

FIG. 35

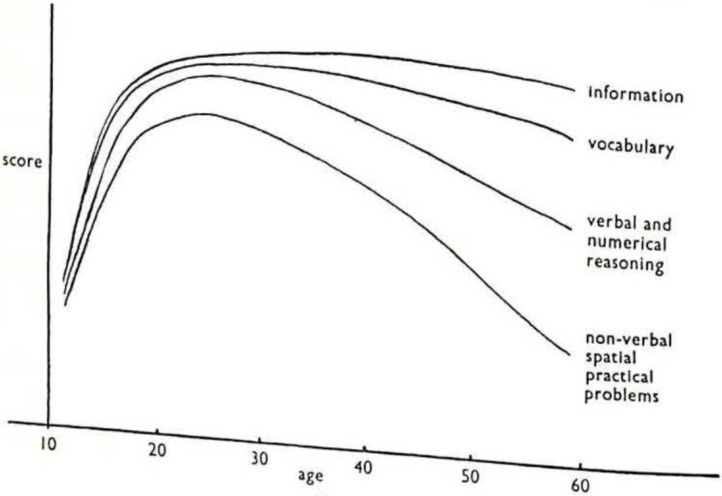

FIG. 36

Just as it was important to separate the different components, memory, vocabulary and reasoning, when we considered the development of altitude of intelligence, so it is similarly important when we consider mental deterioration.

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[1] See Anastasi and Foley, *op. cit.* Ch. 9

In general, the attainments most commonly used in life, *e.g.* vocabulary and information, deteriorate less rapidly than the power to reason, to carry out unfamiliar non-verbal tests, and performance tests. So we have the picture given by Wechsler and Raven (Fig. 36). (See also Anastasi and Foley, p. 287.)

Vocabulary is held to the last. The slower rate of deterioration of vocabulary and information gives us a clue as to why the normal adult's powers do not appear to diminish until well after middle age. Knowledge and experience in life more than make up for the loss of innate powers either of memory, of relation finding, or of reasoning.

(*d*) *Consequences for the School and Educator*

Memory and reasoning both increase rapidly in altitude as the child grows older, and if we compare children who are developing rapidly with those whose progress is much slower it is clear that as the secondary school years approach, the divergences in the various abilities will become very marked indeed. It may therefore be desirable to segregate children for purposes of efficient teaching. The segregation, of course, should only refer to formal class instruction in special topics. The brighter and duller children should be together for as much informal work as possible. But wherever the attainment is in definite subjects, such as English and arithmetic, then not only is there a tendency for the better child to be retarded when he works with too many weaker children, but also the weaker children are themselves discouraged by the rapid progress of the better children and by their own inability to reach these standards.

The growth data for memory and reasoning also guide the teacher in the selection of tasks that he can reasonably expect children to perform. This is particularly true of all that was written about reasoning. There are two important things to note here. First, *the progress towards sound formal reasoning should be by the way of intuition, less rigorous perceptions, and concrete material and actions*, and lead finally to the use of verbal, numerical and abstract operations. The use of concrete material should not be pursued as an end in itself. It should be regarded for most children as a means to an end, the end being the ability to master abstract thought. Secondly, we must begin with simple relationships and build up more complex configurations of thought which should be discovered as far as possible in the first place by inductive methods. The global, intuitive and operational stages of Piaget would lead us to careful considerations of what kind of material to introduce to children in their primary school careers.

We may return to the development of memory and reasoning in order to examine how far we should make use of rote memory and how far we should make use of the child's powers to reason. As Burt implies in Appendix III to the Hadow Report, we should not throw over too hastily the child's remarkable facility for memory, particularly, in the earlier years between four and nine, for during this period his ability to reason is not well developed and he finds that memory is the more economical means of acquiring information, but as soon as the reasoning power has developed to the stage when concrete and formal problems can be attempted, then more use should be made of it. At all stages whenever we meet new, strange material, we depend heavily on memory. Memory enables us to hold the facts which later should be related, analysed and synthesised by the more powerful instrument of reason.

Lastly, the curves showing the growth of intelligence tell us how important it is to make allowance for age when selection tests are compiled. Even over such a short period as one year the change of intellectual ability with age is sufficiently marked to make an allowance for age necessary. All standardised tests, therefore should take account of this change with age.

(ii) *Development in Breadth of Intelligence*

(*a*) *Theory and Results*

We have already seen (Ch. VIII) that different *kinds* of intelligence begin to reveal themselves in adolescence ; thus a boy may be intelligent in a practical way, as in dealing with mechanical things, or he may be intelligent in understanding verbal and abstract material, as required in grammar school study. Thorndike contrasted *altitude*, the level which a child could reach in any particular field, with *breadth*, the range of different kinds of activity which he could master at any level or altitude. Thus a child might be able to reason at a certain level in a verbal, numerical, non-verbal, symbolic (mathematical) or practical material. Similarly children's skills develop in games, craft, art, music, English and arithmetic. It has been widely held that these more specialised forms of intelligence develop with age, that the *breadth* of intelligence changes as a child grows older. The influence of general intelligence is gradually supplemented by new forms of intelligence. General mental ability tends to be differentiated into more specialised group abilities (see Ch. VII).

During the very early periods of life the infant's abilities and activities are global, and there is little differentiation even in simple movement. Notice how the very young child stretching to touch an object, stretches with all limbs, the head, and even the trunk. But as a result of circumstance and maturation more specific activity soon begins to appear. Clinical and observational studies of newly-born infants and very young children show how the global motor activity differentiates into more specific movements.[1] There is a continuous development of specific behaviour patterns from a diffuse activity involving the entire organisation. Even in these early stages, however, the opposite process of integration must be admitted as an explanation of the data obtained. Later during the course of childhood a drop in correlation between the Binet items has been found to accompany increase in age. This fact supports the theory of differentiation. Also, when injury to the cortex occurs in early life, the extent to which the neighbouring cortex can take over the function of the destroyed part is very considerable.

When we study older children, that is from seven onwards, the evidence fails to support wholly the view that abilities differentiate with age, attractive as this theory may be. Burt's early study, in which he showed that Spearman's two-factor theory failed to explain the mental abilities of nine-year-olds, supports the view of differentiation. If there is differentiation, say in the abilities of a group of children between two ages, we should expect the correlations to change with increase in age to cause a rise in the loadings of the group factors as compared with the general factor.

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[1] Carmichael, L., *Manual of Child Psychology*, Ch. I (Wiley, New York)

Factorial studies of pre-school children reveal high correlation between memory and intelligence tests. Garrett compared the correlations between memory and vocabulary tests obtained from a sample population of pre-school children with those from a sample of college students and found a big drop. Anastasi and Foley [1] report several other researches which support the theory of general differentiation between pre-school years and early adulthood. But populations of college students tend to be very homogeneous, and hence test correlations obtained from such groups tend to be low in any case. Such differences should be allowed for before comparisons are made. Vernon [2] corrected some results of Balinsky, who applied the Wechsler Scale to several groups ranging from 9 years to 50+ years of age, and found no consistent evidence of differentiation.

There have also been studies within the school population, where groups selected were more or less equally homogeneous. Several groups of nine to fifteen year old pupils have been tested [1] and a fall found in the contribution of the general factor to the test variance. On the other hand, several research workers [3] report either no change or a *rise* in the contribution of the first factor. Peel and Graham gave a battery of verbal, pictorial, spatial and performance tests to some 900 primary school boys and girls of nine years of age, and again later when they reached ten years of age. They could find no evidence in support of differentiation and in fact the results seemed to be rather in favour of integration. The conclusions reached by Peel and Graham support Vernon's view that ' there is no general tendency towards differentiation, except perhaps in early infancy ', but more recently Graham [4] has re-examined the data and suggests that the rise in correlation may be due to the rise in reliability of the tests.

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[1] *Op. cit.*, p. 513

[2] Vernon, P. E., *Structure of Human Abilities*, pp. 29-31 (Methuen)

[3] Peel, E. A., ' Evidence of a Practical Factor at the Age of Eleven ' *B.J. Ed. Psych.* XIX, p. 1, 1949

[4] Graham, D., ' The Differentiation of Ability in Primary School Children—A Comment ' *Research Review* 4, 1953

Burt has since reviewed his own work in this field and also that of other workers in Britain and America and concludes that the 'biological, neurological, and statistical evidence all appears strongly to support the view that with increasing age, intellectual ability tends to become more and more specialised'.[1]

The source of much of this conflicting evidence may lie in weaknesses of experimental design, for in addition to the need for testing equally homogeneous groups, the tests should be equally appropriate for all groups tested, and there may be difficulties introduced by practice if the same group is retested. The influence of schooling may have enormous effects. As Vernon suggests, if each subject is well integrated with the others and the formal school subjects with outside experience and activities, the consequences would lead to integration. If, on the other hand, the instruction is formal and if also many subjects are taught separately, then the tendency would be towards differentiation.

In the main, differentiation shows itself more clearly in very early years. There is little conclusive evidence of differentiation over the primary school years, but by the ages of eleven, twelve, thirteen, there is overwhelming evidence for various specialised intellectual factors such as the verbal, spatial, and practical abilities. Lastly, whether intellectual abilities differentiate or integrate is dependent upon interests, background and teaching.

(*b*) *Consequences for the School and Educator*

The emergence of the more specialised forms of ability with age and the importance of interests, background and education in developing these abilities has obvious implications for the work of the *primary school*. The syllabus should be wide to include much more than the narrower concepts of English, arithmetic, with some history, geography, art and nature study. There is a case for developing the practical side. This need not be in formal woodwork, but could be developed in a medium of cardboard, fretwork, hardboard and so on. The more varied the experience in the primary school the better. This variety would help the selector, particularly if one of his main problems were to differentiate between those boys and girls fit for grammar school and those fit for the commercial, technical and art schools. The selector can only place children in these schools on grounds of special aptitudes if the special abilities have merged.

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[1] Burt, C., 'The Differentiation of Intellectual Ability' *B.J. Ed. Psych.* XXIV, p. 85, 1954

On the other hand, it is the business of all schools to integrate the different abilities and interests which are beginning to emerge. The school work should also be integrated with the broader outside life in the community and family. Differentiation, as opposed to mere dissociation of personality, implies that there is some sort of integration going on at the same time. The person who is well differentiated is able to relate each part of his personal interests and attainments by a process of integration. This may be one reason why these two aspects of the same process are so difficult to disentangle by factorial methods. The life of the dissociated person, on the other hand, tends to consist of well isolated tendencies which he is not capable of relating to each other.

(iii) *Development in Attainment*

Side by side with the development in quantity and quality of intellect is the child's progress in school attainments. The relationship between attainment and measured intelligence is more intimate than that of proximity, for attainment is in part the measure of intelligence, but we usually consider the development of attainment in English and arithmetic separately from intellectual growth.

This has advantages, for we are able to compare the progress of a pupil's attainments with his intellectual growth.

The reader may recall that it was emphasised in Chapter VIII that the intelligence quotient measures a rate of growth, given by

$$\text{I.Q.} = \frac{\text{Mental Age}}{\text{Chronological Age}} \times 100$$

Now the growth of attainment may be measured in a similar way with say, E.Q. (for English quotient) and A.Q. (for arithmetic quotient), by

$$\text{E.Q.} = \frac{\text{English Age}}{\text{Chronological Age}} \times 100$$

The English age may refer to overall performance in a standardised 11+ test, or it may refer to more specific aspects of English attainment, such as spelling age, reading age, silent reading age (and composition age).

A child's I.Q. and E.Q. (or A.Q.) may be compared by the ratio $100 \times \frac{\text{E.Q.}}{\text{I.Q.}}$, which is called his *achievement ratio* (A.R.) in English (or arithmetic).

When a child's achievement ratio is less than 100, he is said to be *retarded*. He is not working up to capacity and the main purpose of remedial education is to put this deficiency right. Many children are slightly retarded and it would be an oddity for a child to have a markedly superior achievement ratio in any attainment test, for the I.Q. gives us the base line, as it were, of his powers and output. A high A.R. would lead one to suspect the intelligence measure or to conclude that some very efficient coach had been at work on the attainment test material!

The concept and use of the achievement ratio can be condemned on several grounds. First, if known to the pupils, it could bring distress, particularly to pupils with high I.Q.s. Secondly, from the very nature of general intelligence, which forms the basis of the I.Q., it is debatable that a child with a high I.Q. should *necessarily* have a correspondingly high A.Q. or E.Q., that is, assuming his education and learning has been normal, since the A.Q. and E.Q. are based largely on the verbal factor of intelligence. Of course, any deficiency in English and arithmetic attainments should be viewed with some concern, but a better way of looking at the problem would be to consider the spread of the A.Q. and E.Q. and not draw upon the concept of the achievement quotient. The artificiality of this ratio is rather forced upon us when we consider those children with an achievement ratio exceeding

100. Such cases would be oddities, difficult to explain in terms of current theory. But they exist as a necessary consequence of the way used to compute quotients and achievement ratios (see E. A. Peel, 'Achievement Ratios and Remedial Education', *N.F.E.R. Bulletin* No. 9, March 1957). They would be the bookworms, with plenty of book learning but not such high general ability. Lastly, if we are prepared to ask whether the English and arithmetic attainments reach the level indicated by the general intelligence we should also apply the same concept to other attainments in less academic fields.

The achievement ratio to which educators pay most attention is that referring to the reading attainment of the child, since reading is the key to almost every other school subject. This is, however, a vast problem, and the reader is referred to the monographs by Schonell,[1] Burt,[2] Fleming,[3] Hill,[4] and Highfield,[5] where the problems of backwardness and retardation in reading and the other *basic* attainments in English and arithmetic are fully discussed, where methods are suggested for remedial treatment, norms of attainments for different ages provided, and results of research set out. On the special function of Remedial Education the reader is referred to the articles and reports of the Remedial Education Centre at Birmingham University.

(iv) *Reading List*

TERMAN, L. and MERRILL, M. *Measuring Intelligence* (Harrap, London).
BURT, C. Appendix III, *Hadow Report.*
ISAACS, S. *Intellectual Growth in Young Children* (Routledge, Kegan Paul, London).
ISAACS, S. *The Children We Teach* (University of London Press).
PIAGET, J. *Psychology of Intelligence* (Routledge, Kegan Paul, London).
PIAGET, J. *The Child's Conception of Number* (Routledge, Kegan Paul, London).
PIAGET, J. *Logic and Psychology* (Manchester University Press).

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[1] Schonell, F. J., *Backwardness in the Basic Subjects* (Oliver and Boyd, Edinburgh)

[2] Burt, C., *The Backward Child* (University of London Press)

[3] Fleming, C. M., *Research and the Basic Curriculum* (University of London Press)

[4] Hill, M. E., *The Education of Backward Children* (Harrap, London)

[5] Highfield, M. E., *The Education of Backward Children* (Harrap, London)

PIAGET, J. *Play, Dreams and Imitation in Childhood* Ch. VI (Heinemann, London).
BURT, C. *Mental and Scholastic Tests* p. 256 (Staples, London).
ANASTASI, A. and FOLEY, J. P. *Differential Psychology* Ch. 9 and pp. 512-14 (Macmillan, New York).
WECHSLER, D. *The Measurement of Adult Intelligence* (Williams and Wilkins, Baltimore).
HUMPHREY, G. *Thinking* (Methuen).
RAVEN, J. C. 'The Comparative Assessment of Intellectual Ability', *B.J. Psych.* XXXIX, p. 12, 1948.
VERNON, P. E. *Structure of Human Abilities* pp. 29-31 (Methuen, London).
PEEL, E. A. and GRAHAM, D. 'Differentiation of Ability in Primary School Children', Pt. I, *Res. Rev.* 1951; Pt. II, *Res. Rev.* 1952.
PEEL, E. A. 'Evidence of a Practical Factor at the Age of Eleven', *B.J. Ed. Psych.* XIX, p. 1, 1949.
PEEL, E. A. *The Pupil's Thinking* (Oldbourne Press, 1967).
PEEL, E. A. 'Intellectual Growth during Adolescence', *Educ. Rev.* XVII, 3, 1965.
GRAHAM, D. 'The Differentiation of Ability in Primary School Children—A Comment', *Research Rev.* 4, 1953.
BURT, C. 'The Differentiation of Intellectual Ability', *B.J. Ed. Psych.* XXIV, p. 76, 1954.
SCHONELL, F. J. *Backwardness in the Basic Subjects* (Oliver and Boyd, Edinburgh).
BURT, C. *The Backward Child* (University of London Press).
FLEMING, C. M. *Research and the Basic Curriculum* (University of London Press).
HILL, M. E. *The Education of Backward Children* (Harrap, London).
HIGHFIELD, M. E. *The Education of Backward Children* (Harrap, London).
BÜHLER, C. *From Birth to Maturity* (Routledge, Kegan Paul, London).
Nat. Found. Educ. Res. *Bulletin* No. 9, March 1957.

(v) *Exercises*

1. Give examples from your own observation of small children of the tendency for one obvious relation or intuition to dominate the judgments of children.

2. Note examples of the same tendency in unintelligent adults and also in the case of uninformed persons when they judge new material.

3. Discuss the role of language and 'make-believe' play in aiding the formation of operations in thought. Illustrate your answer with examples.

4. Discuss the implications of Piaget's views on the development of reasoning in children for the teaching of arithmetic in the primary school.

5. Outline the bearing of the theory of differentiation of abilities on the educational concept of tripartite secondary education.

CHAPTER XI

THE STRUCTURE OF EMOTIONAL LIFE

(i) *McDougall's theory of instincts and sentiments* (ii) *Personality traits* (iii) *Temperament and physique* (iv) *Emotional differences in schoolchildren* (v) *Reading list* (vi) *Exercises*

(i) *McDougall's Theory of Instincts and Sentiments*

WE have discussed the differences between individuals in intellectual ability. Let us now consider the emotional and purposive aspect of man's actions. McDougall sought to explain purposive behaviour in terms of a few distinct inherited tendencies which he called instincts. The instincts of fighting, of parental feeling, of escape, are examples of these mainsprings of human action. Besides being inherited and unlearned, instincts are relatively fixed in their patterns of working and explain the more constant patterns of animal, bird and insect behaviour, such as nesting, mating, migrating and searching for food. Human action in circumstances of extreme danger and privation may be controlled instinctively by fear or anger. Under similar conditions a mother may tend to protect her children at the risk of her own life.

An instinct is a pattern of response which has three parts: first, a situation is perceived or understood; then an emotion such as fear, anger, love or disgust is experienced; and finally some action is taken, such as flight, combat, protection, grimace or avoidance. An instinct, in McDougall's own words, 'determines its possessor to perceive and to pay attention to objects of a certain class, to experience emotional excitement of a particular quality upon perceiving such an object, and to act in regard to it in a particular manner, or at least to experience an impulse to action'.[1]

The extremes of this tripartite tendency, namely the situations or objects perceived, and the resultant action, are more susceptible to variation than might appear from the definition. This is particularly true of the first. Fear can be aroused in the human being by a wide variety of situations: meeting a strange animal, being alone in the dark, speaking to or meeting a large group of people, or encountering physical danger and risk. The resulting reactions may vary from simple running away, through less overt retreat, to no action or even an aggressive response. In other words the pattern of an instinctive action is varied rather than fixed. McDougall himself makes this clear when he discusses the influence of intelligence on instinctive behaviour: 'their dependence upon and overlaying by Intelligence reach such a point as to obscure the existence of instincts from the eyes of man himself, especially those of sophisticated men '.[1]

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[1] McDougall, W., *Introduction to Social Psychology* p. 25 (Methuen)

Even the simplest creatures seem to learn variation in instinctive action to meet special circumstances: *e.g.* the alterations in instinctive patterns of fish, birds, animals and, of course, man.

Of modern writers, Burt is the leading exponent of McDougall's views and has this to say of an instinct. 'It is a complex inherited tendency common to all members of a species impelling each individual—

(1) to perceive and pay attention to certain objects or situations;

(2) to become pleasurably or unpleasurably excited about these whenever they are perceived;

(3) thereupon to act in a way likely in the long run to preserve the individual or at any rate the species so acting.'

Burt says nothing here of the change wrought in the inherited tendencies by the experience of the individual during his lifetime, but more recently he made it very clear that experience and intelligence play a large part in modifying the instinctive tendency. He wrote:

> 'Human beings, like other animals, inherit certain innate tendencies, which influence their everyday

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[1] McDougall, W., *Outline of Psychology* p. 134 (Methuen)

> behaviour, at any rate during the earlier years of life. Four such tendencies (or groups of tendencies) are almost universally recognised—feeding, fighting, fear and sex ; there may be many others less easy to establish.
>
> 'In man the modifications and elaborations of these instinctive tendencies, produced by personal experience, are more various, more numerous, and more far-reaching than in any other animal.' [1]

McDougall and later writers carefully distinguish between habits and instincts. The former are mechanically performed behaviour patterns. They are quite inadequate as explanations of the purposiveness of instinctive behaviour. Burt is similarly critical of an explanation of instincts in terms of reflex-theory. He writes :

> 'But the reflex-theory in its turn is now almost universally held to be grossly inadequate as a description of the facts. What is inherited is not so much a localised neural structure, or an invariable pattern of action, but rather a " determining tendency " to be defined by its " end " (or by a specific " need ", " goal ", " condition of equilibrium ", " behavioural function ", " biological purpose ", or " consummation "—different schools prefer different descriptions), and not by any stereotyped set of movements or muscular contractions, to which such a tendency would lead in animals with more limited nervous systems.'

Whilst they recognise the complex, fairly rigidly organised, and apparently unlearned nature of the behavioural action involved in an instinct or physiological drive, animal behaviourists have paid a lot of attention to the initial stimuli which set off this behaviour pattern. There is much evidence that even if the actual action pattern of an instinct is fixed and unlearned the stimulus or cue which sets it off can be varied enormously. Young birds can be made to follow all sorts of objects instead of their parents. These include humans, demonstrated by Lorenz, and moving cardboard objects. Harlow showed that baby monkeys [1],[2] would turn to models for mothering and affection and that such monkeys could grow up to be maladjusted. Some of the model mothers consisted only of frames.

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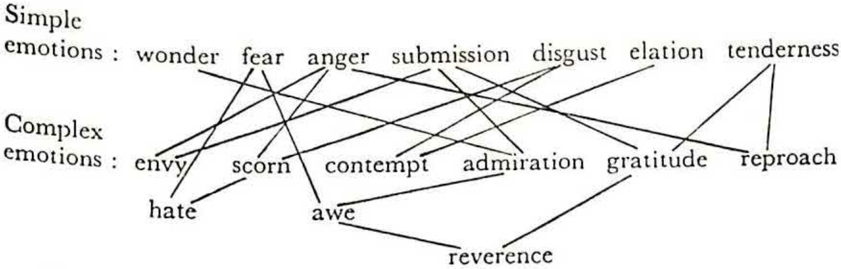
[1] Burt, C., Symposium, 'Is the doctrine of instincts dead ?' *B.J. Ed. Psych.* (See Reading List for details, p. 237)

It seems that the first 'objects' or living entities which are put before or moved in front of the young organism will set off instinctive patterns and that these may not always compel the young creature to act immediately in a self-preserving way. This imitative phenomenon is called imprinting.[3] It is not always easy to substitute an adaptive response for an unadaptive one imprinted experimentally.

The structural aspect of McDougall's theory is seen clearly in his discussion of complex emotions and sentiments.[4] Complex or fused emotions are derived from the simple emotions ascribed to the primary instincts by the combination of two or more of these emotions. For example, we have :



The simple and fused emotions may be organised about specific objects and concepts which enter into the person's experience. These constellations or structures of emotion about specific objects are called *sentiments*. Sentiments are learned and structured, thus differing from emotions which are unlearned ways of functioning. McDougall defines a sentiment as 'an enduring conative attitude towards some object induced by experience of that object'.[5] Typical sentiments might include a hatred of Fascists or a reverence for the Church.

Hatred not only involves the simple emotional responses of anger, fear and inferiority feeling directly towards the Fascists but also affection for those who attack Fascism and elation at its decay or overthrow. Sentiments about objects and people become more generalised into sentiments about ideas and institutions, way of life, church, nationality. Thus love of mother becomes respect for family, which in turn may be generalised to a sentiment of national feeling. Similarly love of a friend may develop into love of companions and so to a sentiment of community feeling.

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[1] Harlow, H. F., 'Love in Infant Monkeys', *Scientific American*, 429, June 1959

[2] Harlow, H. F. and M. K., 'Social Deprivation in Monkeys', *Scientific American*, 473, Nov. 1962

[3] Sluckin, W. *Imprinting and Early Learning* (Methuen, 1963)

[4] McDougall, W., *Outline of Psychology* Ch. XVII (Methuen)

[5] McDougall, W., *Outline of Psychology* p. 429 (Methuen)

Standing at the head of all these hierarchies and diffusing back to the simplest sentiments is the self-regarding sentiment. I can know the self called *me*. This object (me) ' becomes represented in the structure of the mind by a system of dispositions of extraordinary extent and complexity '. This is the self-regarding sentiment and colours all other sentiments. Smith [1] shows the structure of the sentiments in a very clear way in his synopsis of McDougall's system.

Self-regarding sentiments are as varied as humanity—depending as they do on emotional make-up and instinctive origins—overlaid by learnings acquired during life. It is the business of teachers and parents to build up sentiments compatible with a good way of life. We shall discuss sentiments further in the next chapter.

Despite much criticism, McDougall's work has had a profound influence upon modern psychology. The result of his emphasis upon motivation is that this aspect of human activity can no longer be ignored. His instincts have had to be modified but they re-appear in modern theories as ' physiological drives '.

(ii) *Personality Traits*

Some theories of personality traits [2] have been arrived at by more empirical methods. Persons are *rated* for various personal, emotional, and temperamental qualities, *e.g.*, for narrow interests, organisation of personality, conscientiousness, fastidiousness, joy, curiosity, disgust, willingness to co-operate and emotional stability. The ratings are then correlated and the groupings or clusters of *allied* traits discovered by factor analysis. Alternatively, the subject's responses to questionnaires are correlated and analysed by factorial methods. The ratings by experts or persons who know the subjects well, or the subjects' own responses to questionnaire items are not as reliable as the best objective test results. For this reason the factors of personality or temperament which emerge cannot be regarded with the same confidence as the factors of ability.

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[1] Smith, F. V., *The Explanation of Human Behaviour* pp. 128, 129 (Constable, London)

[2] Personality traits can be regarded as permanent clusters or constellations of more specific behaviour responses to limited and specific situations. Thus we may talk of the trait of perseverance. If it is a permanent feature of a person's make-up, perseverance will be shown in many little specific situations—home-work, gardening, hobbies, dealings with other people.

As in the case of the analysis of ability, the factor analysts begin by taking over certain well-known earlier hypotheses on the structure of emotions and the classes of temperamental response. The opposition of two easily recognised forms of insanity, cyclic or manic-depressive and schizophrenic or dissociative insanity, have led to one commonly used opposition, cyclothyme *v* schizothyme. This opposition appears in different researches under a bewildering array of names, sthenic-asthenic, dysthymic-euthymic, etc. McDougall's structure of the emotions has also formed the starting point and the hypothesis for explaining the results of factor analysis.

> 'On the conative side these innate tendencies are analogous to the innate " abilities " which have replaced the old-fashioned " faculties " on the cognitive. They are not to be thought of as well-defined and separated entities, which can be counted once for all and catalogued in a definitive list, but rather as analogous to so-called " group factors ". Some appear to be exceedingly general or complex ; others relatively simple or specific. The particular classification adopted, therefore, like other classifications based on innate characteristics (*e.g.* the classifications of the animal or vegetable kingdom) must be largely a matter of convenience, the headings or labels overlapping one another, and the groups or clusters subdivisible at need into more specialised components.'[1]

Perhaps the most important and fruitful of the theories of personality which have influenced the empiricists is the theory advanced by Jung that human beings can be divided into two primary types [1] according to their attitude to life. These types are known as the *extraverts* and the *introverts.*

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[1] Burt, C., 'Is the Doctrine of Instincts Dead?' *B.J. Ed. Psych.* XI Pt. III p. 144, 1941 and XIII Pt. I, 1943.

According to Jung the extravert personality is interested in the outside world, in reality for its own sake. He is usually cheerful, self-assured, theatrical, talkative. He may be aggressive and demand approval. When in doubt or difficulty he turns to society for assurance and help. The introvert is turned into himself and views the world subjectively. He is reticent, may lack assurance in company. He waits for approval, and when in trouble rarely takes his worries to his fellows. People do not thus fall neatly into two exclusive compartments, and Jung defined a third class of individuals, the *ambiverts*, who possess some of the qualities of both extraverts and introverts.

Extraversion-introversion describes a polarity of *attitude* to the world, but within each class Jung envisaged four ways in which people *function*. These are by thinking, feeling, sensation, and intuition. Examples of the kind of men who might fill these eight categories are :

	Extravert	Introvert
Thinking . .	practical scientists	philosopher, metaphysician
Feeling . .	kindly person who must *feel* to do a thing	schizoid
Sensation . .	cheerful person, pub crawler	artist
Intuition . .	salesman, politician, barrow-boy	mystic

Herbert Read [2] has tried to apply these sub-divisions to children's art. The main opposition between the extravert and introvert has appeared in one form or other in all the main studies of the traits of personality.

Let us now turn to some of these factorial theories of personality and temperament. Burt has given us one of the earliest.[1] As a result of analysing the emotional qualities of normal children, he advances the theory that there is first a general factor of emotionality or emotional instability, then a bipolar factor distinguishing extravert from introvert emotions, *i.e.* assertiveness, sociability, curiosity, anger, from sorrow, fear, submissiveness, tenderness. He identifies the bipolar factor with Jung's extraversion-introversion. The resemblance between Burt's hierarchical classification of personality qualities and his hierarchical treatment of mental abilities is to be noted. In contradistinction American workers have tended to look for unitary traits of personality analogous to the unitary abilities proposed by Thurstone. Cattell[2] claims to have found twelve primary source traits which appear to be what we should call types. They include: cyclothymia *v* schizothymia (see next section); general mental capacity; dominance *v* submissiveness; surgency *v* melancholy; character integration *v* dependent character; neurasthenia *v* vigorous character; cultured mind *v* boorishness.

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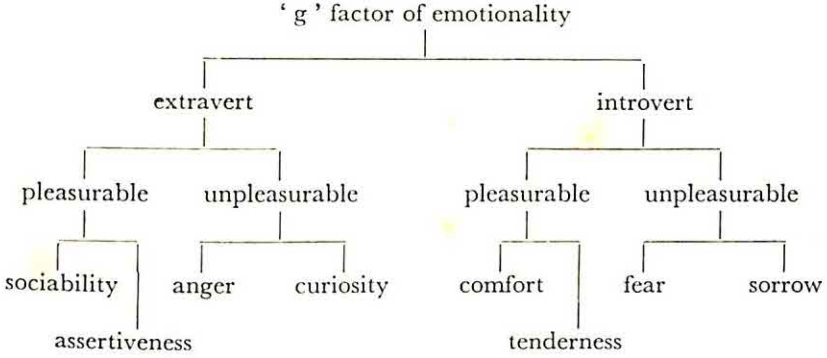
[1] Types are more general than traits and can be regarded as constellations of traits. Very often types are dichotomous, *e.g.* the introvert *v* extravert types. The extravert type may include the traits of cheerfulness, shallowness, self-assurance, etc, while the introvert includes reticence, lack of self-confidence before others, perseverance, accuracy, etc.

[2] Read, H., *Education through Art* (Faber)



These 'source traits' are not necessarily independent. Cattell[3] has since confirmed these traits in a population of women students, but Banks[4] re-analysed the data according to

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[1] See Burt, C., 'The Factorial Study of Temperamental Types' *B.J. P.* (*Stats*) Pt. III, 1948

[2] Cattell, R. B., *Description and Measurement of Personality* p. 313 ff (World Book Co, Yonkers)

[3] Cattell, R. B., 'Primary Personality Factors' *B.J. P.* (*Stats*). Pt. I p. 114 1948

[4] Banks, C., 'Primary Personality Factors—a Re-analysis' *B.J. P.* (*Stats.*) Pt. I p. 204, 1948

Burt's method and obtained a hierarchical picture of the trait structure which resembles Burt's earlier work. These alternative interpretations, in terms of primary traits or hierarchical traits, may be given to nearly all empirical studies.

Two earlier American investigations, one due to Guilford and the other to Mosier, have also had considerable influence. Guilford postulates thirteen factors, not all independent. They include: social introversion, depression, cycloid tendency, rhathymia (happy-go-lucky), ascendance-submission, masculinity, femininity. Mosier also analysed responses to items on questionnaires and produced eight orthogonal primary traits; cycloid tendency, depression, hypersensibility, inferiority, social introversion, public self-consciousness, feeling of intellectual inferiority, tendency to daydream.

There is close similarity between several of the primary traits of these three workers, Cattell, Guilford and Mosier, and, when we take account of the differences between the British and American approach to factorial problems, certain common qualities can be seen in all the views so far put forward. For instance, introversion *v* extraversion shows up in some form or other, and so does emotional stability *v* instability.

It is of interest to note that teachers use two dimensions comparable to the above in describing their pupils. When words such as 'persistent', 'stable', 'sociable', 'co-operative', 'cheerful', 'confident', etc., are written on reports or record-cards, for example, they are not used as if each word is independent of every other word. Nor, if adequate precautions are taken, are they generally used as if all such words are related and produce a 'halo' effect (see page 316). It is found that, in practice, teachers use personality trait names as if they fall into two main clusters, one related to introversion *v* extraversion, the other related to emotional stability *v* instability. Certain trait names such as 'popularity' and 'confidence' tend to come between these two clusters. The word 'maturity' is most frequently in the 'emotional stability' cluster, but when teachers are rating the maturity of fourth-year secondary modern boys it is in the 'extraversion' group. The meaning of the word varies with the context in which it is used. In the case of boys about to leave school, maturity implies ability to get along with others and readiness to face the outside world.[1]

We may ask whether, in the case of teachers' ratings, we are concerned with the personalities of the children or the teachers' perceptions of their pupils. It is, of course, difficult to separate the two. However, we do at least know that ratings of this kind indicate the ways in which teachers attach meanings to words and use them to classify their pupils.

Osgood [2] has shown that there are three important factors of meaning. In other words, when a person wishes to classify any concept, be it another person or an object, he asks himself three major questions : How much do I approve of it ? How active or passive is it ? How strong or weak is it ? Recent work in this country has shown that when a teacher assesses the personality of a pupil he uses the first two of these factors. That is, he asks himself two questions, namely : How much do I approve of him as a pupil ? (*i.e.*, How stable, persistent, co-operative, etc., is he ?) ; and How active is he in the social life of the school ? (*i.e.*, How extraverted, sociable and cheerful is he ?).[3]

(iii) *Temperament and Physique*

The third type of personality theory links differences in temperament with differences in physique. Since the earliest records of civilisation there is evidence that men have always tended to classify individuals according to body build and the accompanying temperamental make-up. Hippocrates classified men according to those of ' habitus apoplectus ' and those of ' habitus phthisicus '. Later followed the fourfold humoural theory which held the field for centuries, according to which there were temperamentally four kinds of man, the sanguine, melancholic, choleric and phlegmatic, according to whether they possessed excess of blood, black bile, yellow bile or phlegm. Modern physiology has replaced the humours by the much more numerous, powerful and exact endocrine secretions.

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[1] Hallworth, H. J., ' Personality Ratings of Adolescents : A Study in a Comprehensive School ', *B. J. Ed. Psych.* XXXIV, 171-177, 1964

[2] Osgood, C. E., Suci, G. J. and Tannenbaum, P. H., *The Measurement of Meaning* (Urbana : Univ. of Illinois Press, 1957)

[3] Hallworth, H. J., ' Dimensions of Personality and Meaning ' *Brit. J. Soc. Clin. Psychol.*, 4, 1965

In particular the rate of secretion and interbalance between the thyroid, adrenal, pituitary and gonad glands would seem to account for many of the psychological qualities implied in the above four categories.

(a) *Up-to-date Theories relating Body Build to Temperament*

The work of Kretschmer[1] marks the modern approach to the problem of physique and temperament, and his theory has influenced all present-day research on this topic. He placed individuals into four physical groups: pyknic, athletic, leptosome or asthenic, and dysplastic (those possessing some or all of the qualities of the first three groups). The pyknic type of individual is short, fat and paunchy; the athletic is deep-chested, broad-shouldered, muscular and large boned; and the leptosomatic or asthenic type is tall, thin, flat and narrow-chested, long and lanky limbed. Kretschmer claimed that these types were correlated with two basic emotional types which *in extremis* developed into two well-known types of insanity: the schizophrenic and the cyclic or manic-depressive.

Persons who are normally schizoid (schyzothyme) tend to be detached and remote from material things, to prefer their own company, to be introverted in the sense defined by Jung, to have visions, etc. In the extreme this tendency may reach dissociation of personality (schizophrenia), hysteria, possession (by the devil)[2] and transcendence. It is Kretschmer's contention that the leptosome, and to a lesser extent the athlete, tends to the schyzothyme type of temperament.

The normal cycloid personality (cyclothyme) on the other hand is characterised by joviality and sociability. Such people are interested in the world, reveal themselves to the world, must have company, are social, friendly, practical, and are extraverted in the sense of Jung. In the extreme cyclic form they show alternative periods of mania and depression. The pyknic type of physique is considered by Kretschmer to be associated with the cyclothyme personality.

The most frequent criticism of Kretschmer's type theory is that people do not fall into clearly defined types, physically or temperamentally; that, if body measurements are taken of many individuals, the results are distributed in a continuum. Indeed it is for this reason that Kretschmer has the fourth class of physique—the dysplastic—possessing a mixture of qualities. The same is also true when we try to group people according to their psychological traits. Most of us have a little of all the properties mentioned, cyclothyme and schizothyme. In the most cyclothymic person can be found schizoid characteristics.

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[1] Kretschmer, E., *Physique and Character* (Kegan Paul, London)

[2] Huxley, A., *The Devils of Loudun* (Chatto and Windus, London)

Furthermore the apparent correlation between physique and temperament is mainly due to a third variable, age. On the whole we get fatter as we get older, and the young person's mental disease is schizophrenia whilst the old man's is manic-depression. When age is 'partialled out' the correlation between body build and temperament is much less. Sheldon and his co-workers in America have attempted to meet this criticism by scaling individuals on a seven-point scale in respect of certain basic components of physique and temperament.

In the case of physique three components were selected after the inspection of several thousand of nude photographs of men students and the subsequent selection of certain anthropometric measures. Three variables of physique were as follows.

Endomorphy (visceral, endodermic, embryonic layer)

Roundness and softness of body. Central concentration of mass. Predominance of abdomen over thorax. Tapering limbs. Small extremities. No muscle relief. 'Hamming' of thighs and upper arms.

Mesomorphy (heavy connective tissue)

Squareness and hardness of body. Rugged, prominent, massive muscling. Large boned. No 'hamming'. Broad shoulders.

Ectomorphy (largest sensory, therefore largest brain and central nervous system)

Linearity, fragility and delicacy of body. Small, delicate. Slight 'thread' muscles. Long limbs. Skinny type.

The three components of temperament were arrived at after comparing the seven-point ratings of a group of young male students for 50 traits. These were clustered into three groups, identified as the temperamental components of viscerotonia, somatotonia, cerebrotonia.

Viscerotonia is roughly identifiable with love of comfort, relaxation, sociability, conviviality and sometimes with gluttony.

Somatotonia is the pattern dominated by the will to exertion, exercise and vigorous self-expression.

Cerebrotonia refers to the inhibitory aspect of temperament. In the economy of the cerebrotonic individual the sensory and central nervous systems appear to play dominant roles. His tendency is towards symbolic expression rather than direct action.

These three components are each made up of twenty traits, each rated on a seven-point scale and finally arranged. Thus each student was characterised by two threefold indices, one for the three components of physique (endo-, meso- and ectomorphy) and the other for the three temperamental components (viscero-, somato- and cerebrotonia). Sheldon correlated the results for two hundred students and claims to have found the following correlation coefficients between individual components of physique and temperament.

Endomorphy and viscerotonia	·79
Mesomorphy and somatotonia	·82
Ectomorphy and cerebrotonia	·83

(*b*) *Theories deriving from Factorial Studies*

Burt [1] was the first to use factorial methods for investigating the relationship between physical build and temperament. He correlated various physical measures—height, weight, girth, etc.—and certain temperamental assessments of a group of schoolchildren. When the physical measures were considered alone he found a general 'size' factor and a bipolar factor differentiation between tall thin children and short tubby children. When the physical and temperamental measures were considered together Burt obtained slight evidence of correlation between stoutness and cheerful qualities and between thinness and inhibited and repressed qualities, but the size of these correlations in no way permitted of the diagnostic use of physique as a measure of temperament. Later students of Burt have confirmed his earlier findings.[1] In general the optimistic views of Kretschmer and Sheldon are not confirmed by factorial researches. There is undoubtedly an association between body build and temperamental types but it is not very significant. As Anastasi and Foley put it, ' the " long-lean " tended to be more inhibited and repressed, and more prone to schizophrenia and allied disorders ; the more " rotund " individual inclined more towards cheerful, sociable reactions and towards cyclical forms of insanity. But again it should be repeated that these relationships were so slight as to be of theoretical interest only.' [2]

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[1] Burt, C., 'Correlation between Persons' *B.J. P.* XXVIII Pt. I, 1937

(iv) *Emotional Differences in School Children*

We have now discussed the structure of emotional and temperamental life.

McDougall's classification is only possible if

(*a*) individuals differ from each other in their emotional response

(*b*) the pattern of emotions in any individual is fairly constant

(*c*) the variety in instinctive behaviour can be described in terms of a few tendencies.

Similar conditions are required also in the factorial theories of temperament and in the attempts to link temperamental types with body build. The empirical facts that underlie all these theories are that individuals differ widely in temperamental, emotional and physical qualities and that there are constant features in the make-up of each individual.

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[1] Eysenck, H. J., *Dimensions of Personality* p. 94

[2] Anastasi, A. and Foley, J. P., *Differential Psychology* p. 452 (Macmillan, New York)

Although these innate differences are rapidly overlaid by and interwoven with learned experience, the teacher can easily verify that they exist and also that each child shows some constancy in his emotional response. Thus a class of pupils contains a few who are very timid in most circumstances, many who are afraid only in a few normal circumstances, and a few who are fearless and aggressive on all occasions. Similarly there is wide variation in general emotionality, in introverted and extraverted tendencies, and occasionally in the more specialised instinctive tendencies we have mentioned. Lastly we may note that very few of the children in the class are tall and thin, very few are short and fat, but that many have no remarkable physical qualities.

It does not need a psychologist to remind the teacher of this variation, but it is strange that many teachers require to be reminded of its educational consequences. Most teachers recognise intellectual variety but many fail to take sufficient account of the emotional and temperamental differences of their pupils. Some children are emotionally more deeply affected than others. They 'take things more to heart'. Some allowance needs to be made for such differences. Also, the same methods will not do for both the introvert and the extravert. The former must not be pushed into unhappy prominence; the latter is best encouraged by such fame. Conversely, he may make capital out of the notoriety gained by clashes with the inexperienced teacher. An outlet must be found for Johnny's aggression or for Mary's loving sympathy. It is our business both to take advantage of these differences in order to promote progress and to educate the youngster to make best use himself of his emotional make-up. We shall discuss this problem more fully in the next chapter when we discuss emotional development.

Temperamental and emotional differences are innate and constitutional in the first place, but as a result of the influence of experience and training, the emotions become organised into learned sentiments, attitudes, beliefs and interests. As we might expect, individuals vary in these attitudes and interests. Also, the sentiments, attitudes and interests of a person are largely responsible for the uniqueness of his personality.

(v) *Reading List*

McDougall, W. *An Outline of Psychology* (Methuen, London).

McDougall, W. *An Introduction to Social Psychology* (Methuen, London).

Burt, C., Vernon, P. E., Thorndike, E. L., Drever, J., Pear, T. H. and Myers, C. H. 'Is the Doctrine of Instincts Dead?' A Symposium. *B.J. Ed. Psych.* XI, Pt. III; XII, Pts. I, II, III; XIII, Pt. I; 1941-3.

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Read, H. *Education through Art* (Faber, London).

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Eysenck, H. J. *Dimensions of Personality* (Kegan Paul, London).

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Vernon, P. E. *Personality Tests and Assessments* (Methuen, London).

Kretschmer, E. *Physique and Character* (Kegan Paul, London).

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Sheldon, W. H. and Stevens, S. S. *The Varieties of Temperament* (Harper, New York).

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Harlow, H. F. 'Love in Infant Monkeys', *Scientific American*, 429, June 1959.

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Osgood, C. E., Suci, G. J. and Tannenbaum, B. H. *The Measurement of Meaning* (Urbana: Univ. of Illinois Press, 1957).

Hallworth, H. J. 'Dimensions of Personality and Meaning', *Brit. J. Soc. Clin. Psychol.* IV, 1965.

(vi) *Exercises*

1. Discuss and illustrate the relationship between types, traits and emotional responses.

2. Make a list of qualities you would look for if you were asked to decide whether a child was primarily introvert or extravert.

3. Observe any very fat (endomorphic) person of your acquaintance and contrast his psychological qualities with those of a tall and thin (ectomorphic) acquaintance. Note how far the evidence supports Kretschmer's or Sheldon's theory.

CHAPTER XII

EMOTIONAL DEVELOPMENT

(i) *The formation of sentiments* (ii) *Functional autonomy of learned drives* (iii) *Human needs* (iv) *What happens when drives are blocked* (v) *Differentiation of emotional response* (vi) *Emotional development at different stages* (vii) *Reading list* (viii) *Exercises*

(i) *The Formation of Sentiments*

THE complexity of adult emotional life is explained by the fusion of primary emotions and their association, through learning and circumstances, with the persons, objects and institutions which enter an adult's experience.

As we have seen, McDougall's theory is that emotional life is governed by the action of a few instincts and the complexity of adult human emotions is explained by the fusion of joint operation of the two or more of these emotions. Thus we have the emotion of *scorn* compounded of *anger* and *disgust*, and the emotion of *awe* compounded of *fear, wonder* and *submission.*

McDougall also speaks of derived emotions like confidence, hope, anxiety, despondency and despair. These emotions are not associated ' with any one impulse or tendency ' but may arise ' in the course of the operation of any strong impulse or tendency '. McDougall illustrates how they work by referring to the derived emotions of a polar party on the march who gradually succumb to adverse weather conditions. They are clearly important since they are associated with a *preconceived goal* and are linked so closely with the ambitions, foresights and insights that characterise human behaviour. Their absence in the regressed adult constitutes a dangerous state when the personality has been broken down as the result of extreme disaster and privation. These emotions do not form part of a sentiment. They are not permanent emotional features, but arise according to the circumstances in which we find ourselves in relation to ambitions and goals.

The most powerful influence in emotional development is that of the *sentiments*, for a sentiment is an enduring attitude towards some important part of the individual's experience. As the individual perceives the object of his sentiment in different circumstances an increasing pattern of emotions is built up around it. The sentiment of respect for family starts from the mother-child relationships, which according to McDougall, call for the instinct of parental love and protection on the part of the mother and the instinctive urge to submission and appeal on the part of the child. As the child grows he *learns* to associate, perhaps, the father and elder brothers and sisters with this situation of appeal and protection. The family satisfies the instinctive urges and becomes tied up with them, so much so that later, if the child overhears squabbles between the parents, he will experience fear, or if an outsider hits his brother he will feel anger. When he becomes older and one of the parents dies, his constructive and acquisitive instincts may be called into play.

The sentiment for family life is not the only sentiment in the life of the individual. During the adolescent years other loyalties may be developing, and there may be occasions when his aggressions are turned *against* the family ; but as the different sentiments themselves are co-ordinated, so the individual finally emerges as an adult, himself starting a family and exhibiting all the instincts of parental feeling, food-seeking, self-assertion, mating, acquisition and curiosity in achieving and maintaining his family. Finally his sentiment for family life may become linked with his sentiment for his country, church, class, occupation, knowledge and values, the whole constituting the sort of man he has come to regard himself. This constitutes his self-regarding sentiment.

McDougall's explanation of emotional development does not depend so much on the differentiation of emotions as on the fusion of primary emotions, the formation of derived emotions, whose function is relatively short-lived but powerful in relation to a strongly felt ambition, and lastly the integration of emotions about objects in the person's experience.

(ii) *Functional Autonomy of Learned Drives*

A rather different approach to emotional development is suggested by Allport.[1] Allport restricts the innate hormic aspects of our life to simple organic drives. The individual acts in such a way as to reduce the tension caused by these drives. This mechanism may explain much of the animal behaviour and that of young children, but as we grow into adulthood these primitive drives recede in importance, being overlaid and supplanted by the more sophisticated motives and goals of the mature being. These motives are what we know as interests, attitudes, values, ambitions, foresights, tastes, and sentiments.

Adult motives are extremely varied and constantly changing. They are also self-sustaining, drawing their energy from the contemporary circumstances—historically connected with previous motives but functionally independent of them. Hence the term *functional autonomy of learned drives and motives*. Here are examples. A man has a need to smoke. In the beginning this habit may have been motivated by curiosity or self feeling: 'I did it because the others did it'. Or a Freudian oral pleasure may be at work. Later perhaps a genuine habit for nicotine may develop. Still later it may be done partly because smoking gives a man a comfortable look when he is about the house.

Now each of the motives for smoking on these different occasions is a part of the contemporary situation and is functionally independent of its antecedent.

A person may take up painting as a hobby. At first it may be due to an urge to copy or to scribble. Then the painter discovers that he has ability; he takes joy in painting 'for its own sake'. Later he may join with other painters; he paints now with half an eye on impressing them or making a good show at an exhibition. He may have work refused, may see accepted work in a different style from his own; he now endeavours to conform or he may return to earlier personal satisfaction. At each period in his development the emotions aroused by success or failure are different; the drives are autonomous, although on the surface the activity is the same—painting.

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[1] Allport, G., *Personality: A Psychological Interpretation* (Holt, New York)

Allport's and McDougall's theories both depend on *learning* and *experience* as causes of emotional development and both lead to the same result, namely, emotional response to an ever widening range of stimuli. Both start from relatively fixed patterns of primitive drives. But there the comparison stops. McDougall's explanation would lead us to more integrated emotional patterns, Allport's to more changeable patterns. Allport uses the principle of scientific economy in that he does not assume an 'instinct' exists until he has to. In his view we admit far more exceptions when we postulate a set of fixed instincts than if we introduce them only when necessary. Human purposes and motives are too diverse to explain in terms of a few primal drives. Pear writes: 'It is necessary to allow for the learning of *new* motives and the acquisition of *novel* interests as the personality matures. When people seek the same goals, the fact may be explained by assuming that similarly constructed individuals living in similar environment, influenced by similar culture, *would* develop similar goals and employ similar modes of obtaining them.'

The picture of adult emotional life given by Allport is that which we see in a comfortable and secure middle-class community. In these circumstances much of the primitive drive is supplanted by the acquired interests of a sophisticated society. But Allport's theory does not apply so neatly to the action of normal adults in situations of great stress, arousing fear, anger, greed, protective feeling or sex. Then even the sophisticated individual may reveal emotional reactions which conform much more to the pattern suggested by McDougall. This tendency is even more noticeable in the case of lower grade adults, whose lives may conform very frequently to instinctive standards.

That McDougall's and Allport's views lead to similar results is suggested by the following quotations from Burt who is an active supporter of McDougall's views, and Vernon who supports Allport's theory.

Burt writes [1]:

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[1] Burt, C., 'Is the Doctrine of Instincts Dead?—Conclusion' *B.J. Ed. Psych.* XIII Pt. 1, 1943

'In man the modifications and elaborations of these instinctive tendencies, produced by personal experience, are more various, more numerous, and more far-reaching than in any other animal. Hence in the older child as compared with the younger, in the more intelligent or well-integrated individual as compared with the less intelligent or the more unstable, and possibly in members of more civilised nations or more cultured families as compared with members of primitive races or families living under primitive conditions, the motives and the interests acquired by the individual dominate more and more over the innate impulses, which are common to all. Thus, at one end of the range, we may find individuals living their lives on a semi-instinctive plane, at the other, individuals whose conduct at the adult stage is, to all outward seeming, almost devoid of instinctive characteristics.

'It follows that, in studying young children, or older persons who have partly regressed, or perhaps never risen above the simple infantile level, the assessment of the strength of these instinctive tendencies is an essential task for the psychological observer. In studying the more normal adult the assessment of acquired interests, motives, and ideals may be far more important; here, indeed, lies a field of research which, as is generally conceded, has been sadly neglected hitherto. In every person, and particularly in the intelligent adult, the way these innate and other tendencies have been progressively differentiated and organised is unique. Hence each individual personality must be studied in and for itself.'

And Vernon[1]:

'The behaviour of the young infant is of course primarily governed by his innate neural structures and their degree of maturation, and by chemical conditions. But from the very start there is so much interaction between instinctive tendencies and environmental influences that it is practically impossible to designate any particular type of behaviour or drive, even in the two-year-old, as innately determined. I would emphasise as strongly as any psychologist the importance to the teacher, parent or clinician, of a knowledge of a child's main drives. Moreover, as already indicated, I accept the view that many such drives are so widespread, in varying strengths, among almost all children (in our own particular civilisation), that they can usually be classified and assessed in quantitative terms. But I would much prefer to regard such drives as interests, attitudes, sentiments and complexes, which may differ greatly in different cultures, which could readily be altered by changed methods of upbringing in early years, and which are still susceptible to modification during later childhood, adolescence, and even adulthood, by skilful psychological treatment.'

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[1] Vernon, P. E., 'Some Objections to the Theory of Human Instincts' *B.J. Ed. Psych.* XII Pt. 1, 1942.

The role of the teacher in the development of the emotions is an important one, whether we take McDougall's or Allport's opinion. If the instincts are taken as relatively fixed, the teacher's job is to canalise them, to adapt education to them, to find a socially acceptable substitute activity' Following Allport's theory the teacher would emphasise new learned interests and, in spite of what many opponents of McDougall say, the roles assigned to the teacher under these two theories seem to differ only in a semantic sense. According to both theories the teacher has to find new human interests to supplant the more primitive drives.

(iii) *Human Needs*

We may now turn briefly to the theory of human needs suggested by Thomas and supported by Fleming. (See the Reading List, p. 258.)

Childhood is not a preparation for adulthood, if by that we have in mind some conscious striving in childhood after adult goals. Childhood is important in itself and has its own laws. The child has to pass through childish stages in order to reach maturity. Thus the child's *need for security* during infancy *must* be fulfilled so that he may reach balanced maturity. The child has his own personal needs and goals.

The needs advocated by Thomas are not biological, but rather what the child requires of society. They demand the co-operation of the members of the society of which the child forms a part. The child is a member of a group, family, class, school or gang, and his needs are those which the group is able to satisfy. First he needs to be accepted by the group, to feel secure in his membership. Then he needs recognition of status, of what he may contribute personally and of what he is as an individual. He claims responsibility. Lastly he needs scope for new experience and adventure.

Thomas arrives at the idea of these needs as a consequence of studying delinquent and unwanted children, and the concept is a very fruitful one to bear in mind when we consider the emotional development of children. If a child is deprived of security, as is seen in unwanted children, then as the child reaches maturity he may fail to develop his personal responsibilities. What goes on in early childhood has a marked influence on later morale. This idea is supported by the studies of Bowlby who has carried out intensive work on the effects of early separation of child and mother.[1]

Thomas emphasises the needs of new experience, security, response or affection, and recognition. Fleming gives a similar list, including the needs of: acceptance by one's group; the need for the child to give and receive tenderness and admiration; the need for fresh experience and adventure (much of learning has this quality); the need for understanding; and the need for responsibility.

She outlines the implications of this theory for home and school. Home should be interesting, involving the co-operation of the children. There should be accommodation for children's possessions, some responsibility undertaken by the children for common welfare, an atmosphere of courtesy and consideration, and parents who are emotionally mature and consistent in their way of life. The child should be aware of the strength of family affection and feel the security which springs from it.

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[1] Bowlby, J., *Maternal Care and Mental Health* (W. H. O. Geneva, Mon. 2, 1951)

The school should offer much the same opportunities : teachers should be socially and emotionally mature ; the active willing participation of the pupils should be encouraged in activities which have a meaning ; the child should find acceptance and recognition by admired groups : learning should be presented as an adventure ; and lastly, there should be an opportunity for the child to contribute deliberately to the corporate life of the school.

(iv) *What Happens when Drives are Blocked*

One consequence of the instinct theory is that those instinctive responses which conflict with the person's self-regarding sentiment and with social and cultural *mores* are blocked, and the energy associated with them finds other channels for its release. This is important for emotional development, for the emotions associated with the satisfaction of primitive instincts become attached to other forms of activity, some of which is socially acceptable and some inacceptable. This activity is called *substitute* activity, and we owe the original idea of such a possibility to McDougall and Freud.

The Freudian theory depends more on substitute activity than does McDougall's theory, for according to Freud there are only two primitive drives—the urge to create and the urge to destroy. These drives are commonly referred to as the sex and aggressive instincts, but it must be understood that the words ' sex ' and ' aggression ' as used by Freud include much more than we normally credit to these terms. According to Freud *all* emotional activity can be reduced to these two primal drives, and much of what we call civilised humanity is a product of the blocking of these in their primitive form by the restrictions society has to place on them.

Frustration does not always give rise to substitute activity. The frustrated person may ' run away ' from the situation, by forgetting, becoming more childish. Blockage may also give rise to intensification of effort to achieve the goal or to re-orientation of the perception of the problem. The latter is learning by insight.

Substitute activities are not always harmful. They may be beneficial. Lewin[1] draws our attention to two characteristics of substitute activity. There is the ease with which a substitute is found and the extent to which it brings satisfaction. The latter is the real test of a substitute activity. Thus a boy may be failing in his school work and take easily to aggressive behaviour, bullying other children. But this will not lead to such a degree of satisfaction as when he can achieve something at games, in hobbies or at practical work. The activity leading to *satisfaction* is never as easy to acquire as the first type of substitution. This is important. The pupil must be made to feel that the substitute activity challenges him as strongly as the blocked goal. Lastly, real activity has greater value than fantasy substitution. So the person who is unable to achieve one ambition will get greater value from directing himself towards and achieving another than by day-dreaming about triumphs in the pursuit of the first.

We may now mention some of the commoner substitute mechanisms which we meet in child and adult behaviour.

Our self-assertive drives are most frequently blocked. This gives rise to *aggression* in other fields. Many of us may recall how we tend to pass on unpleasantness to innocent associates. We are ticked off by the boss and we make things hot for our subordinates or our class. Much social aggression such as lynching, finding scapegoats and persecution of minorities has a similar explanation. These are maladaptive substitutes. Beneficial substitutes would be the attack of new problems in other fields—social, intellectual or manual.

Blockage of sex goals and parental urges may lead to the beneficial substitution of social welfare work, religious activity, medical and missionary work. At a less beneficial level it may lead to excessive love of domestic pets, and at the maladaptive harmful level it may lead to various sexual perversities.

Rationalisation is another common substitute activity. It shows itself when we 'explain away' a failure, in 'sour grapes', in the bad workman who blames his tools, when we explain schemes to make them acceptable. Rationalisations are really believed by the people who make them. We see it a lot in children who are not making the grade in school. Projection is a special form of rationalisation. By it we tend to project the blame, guilt or responsibility for our misdemeanours on to others. It is seen in any form of 'dodging the issue'. It is seen when people blame the tools or circumstances for their failure. In this form it is very common in children. 'It was the pen that did it'. 'The table is too high.'

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[1] Lewin, K., *A Dynamic Theory of Personality* Ch. VI (McGraw-Hill, New York)

Another common form of substitute activity is *autistic thinking*, fantasy or day-dreaming. How many times do we dream of 'getting our own back', of impressing the world with our achievements, or of saving somebody's life. It is seen in wish fulfilment and in extreme cases the wish becomes not only the father to the thought but also to the act. Thus much petty pilfering among adolescents can be traced to realising a fantasy. We may misunderstand a child's lies if we close our eyes to the ubiquitous action of fantasy. Like many other substitute activities even in its minor asocial forms it may have a useful function in making the unbearable things lighter to carry. It relieves tension for a time, and this may be important for future effort and survival, but if indulged in too frequently it leads to a slowing down of active life.

Lastly we may take the familiar substitute activity which we call *identification*. The filmgoer identifies herself with the filmstar; the avid novel reader with the hero. Similarly the small man is nourished by the successes of the political boss.

All these substitute activities lead to an increase in the number and complexity of situations which give rise to emotional response.

A child may also not learn easily. He may fail, and from his failure we find interesting changes in emotional response. He may find some substitute activity or he may run away from the situation. This is always a possibility when the person fears failure, humiliation in the eyes of others, and as he becomes increasingly aware of competitive standards of society and of the self-standards implied in his self-regarding sentiment. So it comes that some events act like barriers. Unfamiliar emotions are evoked and temporarily the individual finds himself at a loss. We have all experienced these situations, on the occasion of our first public speech, demonstration lesson or piece of acting on the stage. These trying occasions sometimes result in a permanent withdrawal of the individual from such situations and from *this stage in his development*. He *regresses* and becomes infantile. Thus the youngster who fails in school may become tearful, develop truanting, and in the extreme may develop childish habits such as nail-biting, bed-wetting or babyish speech mannerisms. He may clamour for the security of home and the protection of his mother.

Regression is not peculiar to childhood. It is very frequent among adults but it takes on a variety of less obvious forms. The man who expects reliability in others but is not prepared to give it ; the worker who practises go-slow methods, unofficial strikes and is only interested in his rights, are examples of regression in adults.

Many forms of regression are maladaptive and lead in children to disturbed emotional development, delinquency and retarded educational growth. As we saw in Chapter VI inability to learn may also have similar consequences. The child guidance service is aimed primarily at detecting the causes of these conditions and at trying to remedy them. The role of the educational psychologist in this highly specialised work has been discussed frequently, and the reader is referred to some standard works in the reading list at the end of the chapter. He is advised to start with Burt's well-known books for full discussions of the many factors leading to backwardness and delinquency.

(v) *Differentiation of Emotional Response*

We now discuss whether the emotions themselves *differentiate* as the person grows older. When we were discussing the differences between the emotional responses of individuals (Chapter XI) we had need to examine the results of factorial analysis. The reader may recall that Burt advanced the view that there was a general factor of emotionality, broad group factors distinguishing between pleasurable and unpleasurable emotions and extravert and introvert types, and more specialised emotions which he identified with the instinctive emotions. Burt's suggestion is relevant when we consider the change of the emotions of a person as he grows older. Might it be possible that in the earliest days of life the infant's emotional reactions are extremely broad and that as a result of experience and maturation these broad emotional responses become differentiated into the highly specific responses which characterise adult life? Quite a lot of research has been carried out on the emotional responses of very young children (see Jersild in the Reading List) and, although the results are not entirely consistent, generally they support the view that the emotional life of a child is much simpler than McDougall would have us believe.[1]

Watson recognised three basic original emotional reactions in children : *fear*, the startled reaction to loud sound, sharp noise or movement, or sudden loss of support ; *rage*, a stiffening reaction to hampered and restricted movements ; and *affection*, an expansive reaction to gentle patting and movements, softness and warmth.

Fear is characterised by trembling, whimpering, sudden screaming, crying and catching of breath. We have all seen this response in very young infants, when a door is banged or even when a stranger makes very sudden movements. Rage is characterised by screaming, holding of breath as in ' kinking ' or ' going black in the face ' and by slashing movements of hands and feet. We see this kind of response when an infant is held tightly for washing or dressing. The ' scenes ' which later become a feature of face washing have their origin in anger at restriction coupled with fear and pain at the suffocating unpleasantness experienced when a wet face flannel obstructs breathing. Restriction of a child's movements does not always lead to anger as any mother of young children will bear out. It is a common practice to wrap up young infants very tightly so that they will go to sleep more readily. It is said to prevent excitement due to the arms being free to thrash about. This phenomenon has been supported experimentally when some investigators found that more than half of their infants showed no signs of rage and many of them fell asleep !

Other researches suggest that the emotional responses of very young children at not even so differentiated as Watson suggests. The broad differences between pleasure and unpleasure have been noted. Pleasurable emotion results from the satisfaction of the basic needs of food and warmth. Emotions at this stage are *global.* The child shows displeasure with the whole body, face, voice, arms, feet and trunk. Sherman could find no clear-cut differences between the displeasure responses of infants. The responses of the children to (*a*) delay in feeding, (*b*) sudden loss of support, (*c*) restraint of head movements, (*d*) being pricked with a needle, were filmed. Expert adults were shown the filmed response but *not* the stimuli. They were unable to detect clear-cut differences in response. Bridges found undifferentiated unpleasure in the first few weeks of life, but Goodenough identifies responses of fear, anger, astonishment and satisfaction at ten months. (See Jersild in the Reading List.)

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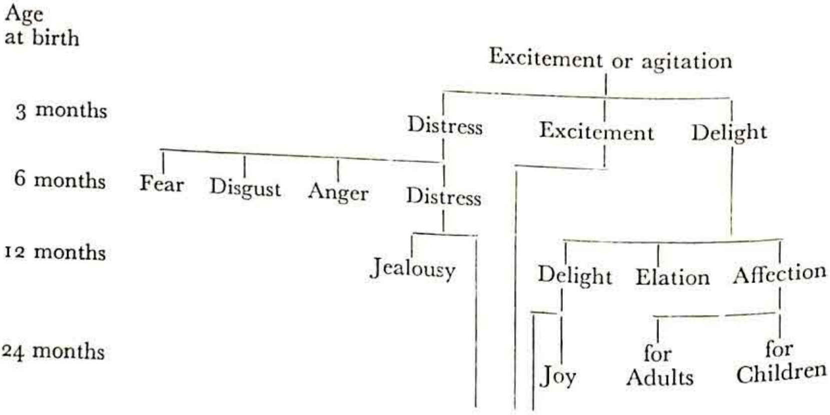
[1] Cf. Hull's theory of primary and secondary drives and Allport's theory of functional autonomy

Gesell recognised different cries for hunger, pain and discomfort at one month of age ; pleasure and delight appear in smiling and vocal expression at three months. Similar opinions have been presented by Buhler.

Finally we may give the picture of early emotional development suggested by Bridges' researches. The diagram has been simplified.



This pattern of development has some similarity to the factorial pattern suggested by Burt (see p. 229). We can assume that during the first few years of life such differentiation is going on. Is it still going on during childhood and adolescence and if so what forms will it take?

(vi) *Emotional Development*

(*a*) *General Features*

There are two other noticeable ways in which emotional responses develop. *First, any given emotion tends to be evoked by a widening range of effective stimuli.* 'The younger the child the more his emotions tend to be aroused by tangible events that impinge *directly* on him. As he becomes older, he becomes increasingly responsive to *signs* and *symbols* that betoken furtherance or hindrance of his welfare and wishes.' Only food will alleviate the demands of a young infant's appetite; later a little nursing followed by food will suffice; later still nursing by itself will quieten a child down, and during childhood and later years the presence of the parent will be sufficient. The child's 'emotions become associated with an enlarging repertoire of activities, plans and interests'.

The process by which the number of effective stimuli increases is partly simple learning. Children copy their parents or intimates when in strange situations. Thus children showed greater fear in air raids when the parents themselves showed greater anxiety. Also a child shows greater fear at a strange noise in the absence of his mother than when she is present. Learning, however, is not the only factor in this development, for the natural maturation of the child's powers of perception, motor activity and cognition all influence the situation.

The second general characteristic of emotional development concerns the expression of emotions. When we are young our emotions find overt, explosive and immediate expression. We use face, voice, limbs and body to register immediately what we feel. *As we grow older, however, the explosive modes of childish expression are replaced by more subtle, delayed, longstanding and indirect reactions.* The mature adult does not immediately punch the jaw of the person who offends his self-feeling, in spite of what the films teach us. This explosive mode of response begins to disappear in childhood and is rare among normal adolescent youths. The response is more likely to take the form of verbal abuse or long-term planning to get one's own back. In adulthood so unusual is physical violence that it takes special conditioning and relearning, such as wars, revolutions or strikes, to provoke the normal individual to physical action. This does not mean that the emotion is any less felt. We have all seen *controlled* anger and fear and have also experienced the internal changes such as increased heart-beat and hormone stimulation concomitant with the appearance of these emotions, even though we have done nothing about them, save perhaps to go home and plan to talk about it to others or to take it out of somebody else. Adults cry less than children and as a consequence their energies become better directed towards the problem situation as well as more socially acceptable.

We may now consider how the theories of emotional development apply in emotional life during childhood, adolescence and adult years. Three clearly distinguishable emotions are the expressions of *anger*, *fear* and *affection*. The child also has need for *security*, *responsibility* and *adventure*. Let us examine the ways in which anger, fear and affection show themselves during the three phases of growth and note also any behaviour indicative of the action of human needs.

The divisions between childhood and adolescence and adulthood are not clearly defined. They are in some sense arbitrary, for in an individual's emotional development we have a continuous and gradual change. Thus at the end of childhood, usually reckoned to be somewhere around ten and eleven years of age, we see many qualities which are characteristic of adolescence. I have therefore deliberately avoided any correlation of these phases with definite age ranges. Fleming warns us also that adolescence means many different things in different countries, and that the psychological qualities of puberty may appear at ages outside the range usually associated with adolescence. Some people retain emotional qualities all their lives which are characteristic of the earlier phases of childhood and adolescence.

(*b*) *Childhood*

Anger shows itself in the earlier years at physical restriction and coercion, as when a child is washed, dressed or has his hair combed. Notice also how angry a child becomes if propelled along forcibly by pushing the back of the head. These outbursts rarely outlive the immediate cause of annoyance. Later, as the child has active exchange with other children, his anger becomes socialised, and we have quarrels over toys and sibling rivalry, manifested usually by physical action such as hitting, kicking and crying. But these active outbursts are usually transitory unless given support by adults or older children. This is something parents are often slow to learn. They cannot understand the short-lived nature of children's anger and are too ready to attribute *adult* motives to childish squabbles. In middle childhood we can see the youngster getting angry over difficult mechanical or jigsaw puzzles. In this period also the expression of anger begins to take verbal form. Physical and social abuse is given and taken ; ' calling names ' is a common feature of disagreements, but with normal mentally healthy children there is little sign of delayed action.

Fear shows itself in young infants at sudden noises and movements, at being dropped or tossed in the air. Fear of high places only develops later, sometimes by experience of falls but more often as a result of the constant anxiety shown by parents. There may also be a maturation factor here, linked with the co-ordination of movements and the perception of spatial relations. Fears of the dark and of strange people may also develop very rapidly in the first few years of childhood. Many of the fear responses are learned from others. There is little evidence that children fear illness, but there is much evidence that the over-dependent child fears separation from his parents. Fear is also socialised during this stage. We see the beginnings of the fear of being excluded.

Affection. Expression of affection is at first very transitory and specific, limited to those who satisfy the child's immediate physical wants—warmth, food and comfort. It becomes attached first to the mother, then to the father, and finally to the family. Apart from the feeling for the mother or those who have most to do for the child, there are only slight signs of the more permanent affections of later life.

At the end of childhood the affections have extended to include friends outside the family, and there are the beginnings of gang loyalties and the worship of friends or schoolmates. The expression of affection is usually demonstrative, vehement verbal declaration, kissing and hugging. The quieter less obvious affection has yet to develop.

Let us now examine childhood from the point of view of human needs. The need for security is uppermost in the early years of life. This shows itself in the many ways in which a child is dependent on the mother and in the many demands made of the family. Demands for recognition and responsibility begin with the signs of possessiveness of toys and personal belongings and insistence on the established place at meal times. Also within his limited world the child shows striking evidence of a demand for adventure and new experiences.

In general the emotional responses of children are characterised by explosive, immediate action—sudden changes of emotion according to whether needs are gratified or frustrated. There is a strong dependence on parents, on acceptance of security, protection and privilege, with only limited compensation in a feeling of responsibility. The child knows little compromise, all is black or white. Although there are the beginnings of ' give and take ' the child is essentially self-engrossed, and one may well attribute the peculiar quality of childhood emotions to an attitude of ' couldn't care less '.

(c) *Adolescence*

Anger. Physical frustrations are still hard to accept but do not give rise to such obvious and explosive expression. The reaction of the adolescent to a puncture in his bicycle tyre or a defect in a mechanical toy or tool, shows what forms anger can take. Sensitivity to social slights, however, mount in importance. The youth is very sensitive to any attack on his prestige, such as being left out of a party or group. Similarly he may react angrily against the restrictive action of parents and family. Anger still finds physical expression, but less intensely and frequently than during childhood. Verbal expression is the chief means of giving vent to rage. There are the beginnings of restriction of overt expression. The adolescent endeavours to keep his temper ; he tends to sulk more than the child for the same reason, and becomes more conscious of the need for self-control. As a result of his experiences, substitute anger, as in fantasy, plays a much greater part than in childhood, and we get the familiar day-dreaming in which the youth is getting his own back and squaring up accounts with those who have bettered him.

Fear. The fears of adolescence are often concerned with physical development. The individual is very aware of the physical changes taking place within him during adolescence and often has marked fears of disease and of physical oddity. The latter is often reinforced socially by the reaction of his fellows in school and club. Thus a very fat boy may feel embarrassed in football changing rooms. These facts can become so ingrained as to produce disturbing inferiority feelings in later years. The adolescent also has fears about failure at school and in examinations and at a loss of social standing, such as being dropped out of teams and clubs.

His intellectual capacities are also developing rapidly. He is learning at a rapid rate, and so it is natural that his fears should be generalised into such fields as religion and philosophy. and one meets the frequent feature of adolescent fears shown as moral unworthiness. This is, of course, also linked with his developing sexual tensions. Also there are fears concerning security and independence. The adolescent is in two worlds : to a large extent he is very dependent upon his parents ; on the other hand he can already see himself as an independent social unit. This often leads him to embarrassment in the presence of adults and the gauchery and clumsiness which are often associated with this phase of emotional development. Similarly his awakened sex feelings lead him to an embarrassment with members of the other sex. He is again undergoing a period of transition, living as it were, in two worlds. This problem of transition is also partly affected by the culture in which the adolescent lives.

Affection. The main feature of the affectionate responses of adolescence is the widening group loyalties which give rise to them. Adolescence is a period of ' crushes ' for members of the same or opposite sex. Ego-ideals are readily formed and many of these loyalties clash with the older family ties, particularly when the loyalties are to new groups. Adolescence is the time of the group and gang life. The series of films produced about the Bowery Boys makes the most of this sort of loyalty, which may sometimes appear rather ridiculous to the mature adult. It is for this reason that youth organisations attract youngsters of this age. Dictators take advantage of this tendency when they form youth movements in connection with political motives. We have read of the terrible situations which were brought about in Nazi Germany through the conflict of loyalties to the youth movement and older loyalties to the adolescents' own families. Later these group loyalties develop into more general affections such as the loyalty to a cause.

Finally, of course, there is the development during adolescence of affection for members of the opposite sex.

We have seen that the need for security is of prime importance in the early development during childhood. It appears also in adolescence, but the need for recognition and for responsibility makes itself felt much more during these years. The adolescent is in a period of transition. Half of him is treated as a child without responsibility and rights and the other half as a potential adult, answerable himself for much of what he does. This increases the need in the individual that society should recognise his status, and the same tendency is aided by the adolescent's awareness of his own intellectual power and mastery of knowledge.

The main features of the emotional life of adolescents concern the loyalties, gang, school and group, and are intimately connected with the transitional nature of adolescence. The adolescent is beset by problems of divided loyalties, accentuated by the lack of adult privileges and responsibilities. He thus appears excessively aggressive and then excessively shy, excessively affectionate and then quite suddenly detached and cool. These are all problems of the stresses and strains of transition. There are, of course, tremendous individual differences due to the culture in which the adolescent lives, his personal history and the nature of his family life, but even allowing for these differences it is quite safe to sum up the problem of adolescence in opposition to our summing up of the problem of childhood by saying that the adolescent ' couldn't care more '.

(*d*) *Adulthood*

The twofold process of emotional development goes on in adult life. Emotions are less overt but are aroused by a wide range of events not directly bearing on the adult's personal life. Thus in the case of anger the mature adult is capable of being aroused by wrongs done to others who have no immediate connection with him ; he may read of subjected races on the other side of the world and feel as much anger as if one of his own intimates was involved. He is responsive to attacks on his prestige, but his anger will show itself in much more subtle forms than those of the child and adolescent. He is capable of organising his activities to counteract such attacks.

Insecurity, ill-health, fears for his family, for economic, political and national survival dominate the fears of the adult. His affections are attached to his own family, to friends and colleagues. His loyalty becomes generalised from personal local groups to clubs, institutions, social strata and country and may show itself in intense devotion and patriotism and even self-sacrifice in the interests of these larger units. He is capable of feeling affection for his family in all conditions, even at times when he may also feel anger and disappointment.

The immature adult or the one who has regressed often reveals two distinct tendencies which may indicate the stage of his arrested development or regression.

First we often meet the adult who is constantly demanding attention. He is not able to carry out tasks unless his part is fully acclaimed. He is oversensitive to his prestige. Such a reaction is typically adolescent.

A more serious regression is shown in the adult who, whilst demanding security, affection and responsibility from others, shirks his own responsibilities and constantly ' dodges the column '. Other immature people are often afraid of taking any action unless it is fully supported by others. Persons who exhibit these tendencies have regressed to childhood.

(vii) *Reading List*

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(viii) *Exercises*

1. You wish to build up a sentiment of love for humanity and a favourable sentiment for learning. Outline how the different emotions might be organised about the objects of these sentiments.

2. Outline the possible changes of motive taking place over a long time in the following activities :

(*a*) a woman's liking of dances from adolescence to old age
(*b*) a man's membership of a sports club.

3. List examples from school and adult life of substitute activity.

4. Trace how the emotions associated with curiosity and acquisitiveness are stimulated during childhood and adolescence.

5. How may an over-institutionalised life, such as used to exist in homes and hospitals, deprive a child of the human needs of security, responsibility and adventure ? Give examples.

CHAPTER XIII

PERSONALITY

(i) *Personality defined* (ii) *The mature personality* (iii) *The assessment of personality* (iv) *Reading List* (v) *Exercises*

(i) *Personality Defined*

WE have now seen how children differ not only in ability and attainment but also in emotions, temperament, interests, sentiments and attitudes. The organisation of these qualities makes the *uniqueness* of an individual that we call his *personality*.

All the definitions of personality stress these points—uniqueness, organisation and wholeness. Burt defines personality as ' a unified pattern of bodily and mental reactions exhibited by the self in response to a social situation '. Allport defines it as ' the dynamic organisation within the individual of those psychological systems that determine his unique adjustments to his environment '.[1] There is a hint of circular definition in both these instances, for what is the ' self ' but the personality ? Also, the word ' individual ' connotes much of what we should call personality. Sherif and Cantril [2] equate personality with the hierarchy of social attitudes and sentiments which an individual holds. A human creature only becomes a person when he has met society and has developed his social attitudes. Allport, on the other hand, believes that we are persons *first* and *then* members of society. In his book on elementary psychology Munn describes personality as the most characteristic integration of an individual's structures, modes of behaviour, interests, attitudes, capacities, abilities and aptitudes '.[3]

These definitions are quite sufficient for our purposes, and we do not need to be worried by the circular tendencies implied in them. It is clear from them that the integrated thoughts, actions and feelings of a man describe his personality. Furthermore we assess his personality by what he thinks, does and feels. All three enter into the methods for measuring personality, and the last two are particularly important in assessments from a person's *expressive activity* (his doings) and his *attitude to values* (his feelings).

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[1] Allport, G. W., *Personality : A Psychological Interpretation* (Holt, New York)

[2] Sherif and Cantril, *The Psychology of Ego-Involvement* (Wiley, New York)

[3] Munn, N. L., *Psychology* (Houghton Mifflin, Boston)

(ii) *The Mature Personality*

What are the qualities of the mature personality? We have partly answered this question in the preceding chapter. Foresight and ambition; the capacity to lose himself in work, play or contemplation; charity, loyalty, generosity, humour, resilience, consistency and willingness to accept responsibility as well as privilege—these are some of the things we look for in a mature person.

Let us now see whether we can reduce this list to a core of essential qualities. I suggest that the mature person has four indispensable qualities. First, he is capable of living to the full and of extending his activities in many fields. We may call this the capacity for *self-extension.*

Second, the mature person is capable of looking at himself objectively. He has a sense of humour, can laugh at himself, and has some insight into his own powers *and* weaknesses. This is *self-objectification.*

Third, the mature person believes in himself and what he stands for. This gives him power, bite and dignity in the face of opposition and ridicule. It acts as a counterbalance to excessive self-extension and self-objectification. We may call it *self-feeling.*

Lastly, the mature person's actions are integrated and consistent with a way of life. This may not be explicit to the holder, but none the less his actions reveal it. We may describe it as *self-consistency.*

These four headings provide the material for a full explanation of the mature personality, but each by itself is inadequate and would lead to a very unbalanced individual.

The merely self-extended person would be busy and sincere, too much so to notice whether he was ridiculous or being imposed upon. His energies would be dissipated in an active life without a course. The excessively self-objective person can become negative, indolent and cynical. The person with excessive self-feeling is always standing on his dignity, and would be very selfish and in extreme cases develop paranoid tendencies such as revealed in some dictators. Lastly, the person whose life is dominated by some single purpose to the exclusion of the other qualities becomes the zealot or bigot, a difficult person to live with, without any of the human sympathy and understanding we expect in a mature person.

We may illustrate the four requirements in greater detail.

(*a*) *Self-extension*

Essentially it is opposed to egocentricity, selfishness and self-pity. It does not necessarily imply extraversion, for the introvert may be equally self-extended. As Allport writes: ' whenever a definite objective orientation has been attained, the pleasures and pains of the moment, setbacks and defeats, and the impulse for self-justification fade into the background.'[1]

Self-extension is really synonymous with involvement. If a person has many interests he is capable of great resilience in the face of obstacles. When a person is extended only in one direction and he meets resistance he comes to a full stop—even to the point of suicide, as in Somerset Maugham's pianist in *Quartet*. The study of biographies reveals countless examples of self-extension. Each life has a characteristic extension.

(*b*) *Self-objectification*

By this we mean the power to see ourselves ' face to face ' and not merely ' through a glass darkly '. We can see our strong and weak points. We recognise our pretensions and foibles, when we are being humbugs, when pedants. We learn to laugh at ourselves and to develop a sense of humour. This is not the same thing as a sense of the comic (a sense of comic usually refers to the ridiculous in *others*). Most people claim to have a sense of humour. The real test is whether they can laugh at the things in themselves which they value and still continue to value them. Can I occasionally see behind the solemn spectacle which is myself to see it as an amusing show? That is true humour. We tend to bypass the things which really matter to us. How difficult it is to laugh off a blow to our prestige, no matter how trivial the issue!

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[1] Allport *op. cit.* p. 213

(*c*) *Self-feeling*

The mature person is clearly aware of and prepared to maintain the integrated entity called his self. He has a sense of his own place in and contribution to society. He will take on personal responsibility for what he is. He knows what he stands for and is determined to remain standing. So in debate, or in conducting a class, a sense of self-esteem and dignity is a *sine qua non* for success. Where self-feeling is absent we receive amused pity, but the ideal we stand for is killed. The appeal of Charlie Chaplin's film roles lies precisely in their lack of self-feeling.

(*d*) *Self-consistency*

Allport points to the value of religion and humour as means of setting a frame of reference for one's life that is at variance with the mundane. Humour makes one's problems seem trivial (see (*b*) above), and religion relates them to a vaster, higher scheme. This makes for integration and consistency of personality. Following Spranger, Allport lists six other systems of evaluation which may make for consistency of an individual's actions. They are

Theoretical values	discovery of truth
Aesthetic values	form, grace, harmony, fitness
Social values	love of people, persons as ends
Economic values	useful, practical
Political values	power and influence
Hedonist values	pleasure, sensory experience

Each of us has an overall standard of life that is compounded in some way of these values. Some are dominated by one, some by another, but the pattern which emerges for each mature individual is consistent, and the pattern is revealed in the life he leads. The Allport-Vernon test of values[1] is based on this classification.

(iii) *The Assessment of Personality*

Everyone assesses the people met in the daily round of social existence. Candidates, pupils, employers, shop assistants, colleagues and neighbours are assessed as self-reliant, ambitious, polite, reliable or honest. These are aspects of personality, and when we write testimonials or references for applicants we are expected and are quite prepared to describe their personal qualities. We take care when writing references to think about our judgments, but they are none the less partly subjective. The ephemeral judgments which we make to ourselves in the course of our daily life are open to more serious criticism. They are often hasty, incomplete, unanalysed, general impressions and intuitions. Often they are not impartial and reflect our own moods, misunderstandings and prejudices.

The psychologist has also to start from this same material when he assesses human personality but he tries to refine his impressions by standardising his techniques. So we have the method of making assessments of character that is used in school record cards. We make use of exact descriptions of the qualities required ; we choose qualities which we can expect a teacher to be able to observe ; we choose qualities relevant to school progress ; we warn teachers to be on their guard against the ' halo ' effect ; and we recommend that teachers try to envisage the child in concrete situations calling for the character quality being assessed.

We use these methods of assessing ordinary school children in preference to applying personality tests because the latter may have one serious drawback. It is sometimes difficult to devise a test situation which is a natural stimulus for temperamental responses. There is a real difference between a paper test for intelligence and a paper test for emotional response. The former constitutes a natural stimulus for evoking the quality it is intended to test, as in the following item.

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[1] Allport, G. W. and Vernon, P. E., *Study of Values* (Houghton Mifflin, Boston)

Complete the line of numbers by filling in two numbers in the blank spaces.

1, 3, 5, 7, 9, ( ), ( )

The *natural* response of the testee is to master the item, which is just what we want. But a paper test of prevailing emotional mood may fail to provide a natural stimulus for the response required. One of the items in the Allport *ascendance-submission* test can be used to illustrate this point. The testee is told to imagine that he has arrived late in church, and all but the front seats are full. He is asked what he would do: Go boldly down to the front of the church—Always?—Sometimes?—Never? This item may fail since the testee may wish to deceive others or he may even deceive himself.

There may have been many attempts to make paper tests of personality foolproof, but the general criticism still holds for much of the material published.

What are the methods of assessing personality? Burt [1] outlines three main groups of controlled methods.

(i) Interviews, by which the person is rated, graded and ranked on the basis of the impression of the interviewers
(ii) Tests
(iii) Observation of the person in standardised natural situation.

The method of school records combines features of (i) and (iii), since the child is in effect both interviewed and observed in the standard situations of classroom and playground.

Vernon [2] provides a comprehensive account of the chief methods of tests and assessments. He discusses: interviews; impressions and measurements of physical signs and expressive movements; performance and cognitive tests; miniature and real life situation tests; personality ratings (of traits); self-rating and personality questionnaires; measurement of attitudes, interests and value judgments; and projection techniques.

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[1] Burt, C. L., 'The Assessment of Personality' *B.J. Ed. Psych.* XV, 1945

[2] Vernon, P. E., *Personality Tests and Assessments* (Methuen, London)

Many of these methods are not very applicable in the school situation. The interview is very practicable and is used widely for borderline cases in selection procedures. In spite of Vernon's admonition about the unreliability of the interview it is proving indispensable as a last screen when all other information has been obtained, but it must be standardised and conducted by people who know its purpose. Pencil and paper information and vocabulary (forced choice) tests seem to yield more valid results than self-rating tests and personality questionnaires.

Ratings of children's personality traits by teachers are more practicable and yield more reliable results than questionnaires and situation tests (see Vernon, Chapter XI), but their prime defect is that 'they represent crystallised emotional attitudes of the raters towards the ratees, even when the rating scales attempt to emphasise observed behaviour' (*op. cit.*, p. 202). The ratings are worth much more if made on the basis of observation of the child's behaviour in a specified situation.

The behaviour and cognitive tests, such as tests of perseveration, fluency and variability of output, are not so applicable in normal educational work. However, in the examination of maladjusted, neurotic and delinquent children they may add useful information.

Projective tests too have only limited use in usual school work, but in the search for background and emotional influences underlying maladjusted and retarded states they are proving useful. The commonest tests are the Rorschach Ink Block Test and the children's version of Murray's Thematic Apperception Test. The principle underlying a projective test is the presentation to the testee of a relatively unstructured situation which he develops projectively according to the dominant tensions in his personality. (See references in the Reading List.)

For most educational requirements in connection with school records, selection for secondary education and advice about vocations, it seems that we must rely in the main on teachers' ratings of pupils' personality traits. The basic principles for such rating scales are as follows.

(1) The trait must be clearly defined in terms of a definite situation met in school life. So the trait of 'likeability' has been defined [1] as follows.

> A 'likeable' child is one you would take on holiday with you.
>
> A 'likeable' child is one you would choose to represent the school at a Scouts' jamboree.

(2) The trait must manifest itself in school life. School life must provide an incentive to the child as far as the trait is concerned.

(3) Use a loose card system (a card for each child) and concentrate on one trait at a time. This counteracts the 'halo' effect of the general impression the child has made on the teacher.

(4) Avoid the tendency to 'bunch' the estimate excessively. There is a tendency in making these less tangible estimates to play for safety.

(iv) *Reading List*

ALLPORT, G. W. *Personality: A Psychological Interpretation* (Holt, New York, 1937).

SHERIF, M. and CANTRIL, H. *The Psychology of Ego-Involvement* (Wiley, New York).

MUNN, N. L. *Psychology* (Houghton Mifflin, Boston).

SPRANGER, E. *Types of Men* (Niemeyer, Halle, 1928).

BURT, C. L. 'The Assessment of Personality', *B.J. Ed. Psych.* XV, 1945.

VERNON, P. E. *Personality Tests and Assessments* (Methuen, London).

ANDERSON, H. H. and ANDERSON, G. L. (eds.). *An Introduction to Projective Techniques* (Prentice Hall, New York).

HUNT, J. McV. (ed.). *Personality and the Behaviour Disorders* (Ronald Press, New York).

EYSENCK, H. J. *The Dimensions of Personality* (Kegan Paul, London).

EYSENCK, H. J. *The Scientific Study of Personality* (Routledge, London).

EYSENCK, H. J. *The Structure of Personality* (Methuen, London).

(v) *Exercises*

1. Take any biography, autobiography or novel in which a person is clearly portrayed and list characteristics of strength *and* weakness under

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[1] Cockburn, D., *A Statistical Study of Teachers' Preference among their Pupils* Unpublished M.Ed. thesis, Durham, 1949

the four headings of self-extension, self-objectification, self-feeling and self-consistency.

2. Make a list of some personality traits you would look for—
   (*a*) in assessing the personality of a 10-year-old pupil
   (*b*) in a student applying for admission to a teachers' training course.
3. Devise miniature real life situations to test
   (*a*) honesty
   (*b*) the feeling of responsibility
   (*c*) perseverance.

CHAPTER XIV

THE PERSON IN SOCIETY

(i) *Social psychology and education* (ii) *The individual and the group* (iii) *The cognitive content of attitudes* (iv) *The emotional basis of attitudes* (v) *Social learning* (vi) *Leader and led* (vii) *Morale and group life* (viii) *Reading list* (ix) *Exercises*

(i) *Social Psychology and Education*

THE social nature of education has been assumed throughout this book. Several times we have referred explicitly to the social aspect of learning and development in connection with mass-learning and emotional growth. We now collect these loose strings and set out some of the facts about social life.

Society is made up of *individuals*, and the social psychologist studies 'every aspect of the individual's growth in society'. We should add that he is also concerned with the person's social *experience*. Individuals usually come together in *groups*. A group is a collection of individuals bearing an *explicit* psychological relationship to each other.

We have therefore two broad problems to investigate, the relation between the individual and the group of which he is a member, and the nature of group life and morale.

Dewey [1] considered that social life, education and communication are almost identical. 'Society not only continues to exist *by* transmission, *by* communication, but it may fairly be said to exist *in* transmission, *in* communication. . . . Not only is social life identical with communication, but all communication (and, hence, all genuine social life) is education.' This is a view that Lewis [2] has also developed.

We have to know how this communication works within and between groups. This is true whether we incline to the view that the individual shall be somewhat subordinated to his group, or, at the other extreme, as when we believe that the group is bad, that the purpose of communication and education is to free him from the limitations of his society. Wherever our educational aims lie on this range, we must know something about the dynamics of interpersonal relationships, of communication between individual and group, and of the factors making for cohesion of group life.

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[1] Dewey, J., *Democracy and Education* (Macmillan, New York)

[2] Lewis, M. M., *The Importance of Illiteracy* (Harrap)

In his day-to-day work the teacher has to focus his attention on the smaller world of the classroom. His ultimate objectives are those already mentioned, but his immediate practical task concerns a class of pupils. Teaching is communication, and classroom relations are a special case of human relations. So the teacher has to be doubly aware of the social and psychological forces that constitute society, first in connection with his own life and his educational goals and secondly as the leader of the small group in the classroom.

Few descriptions of society are more apt for our purposes than Ginsberg's statement. Society is ' a network of individuals related to one another in an infinite number of ways forming unities or wholes varying enormously in character and complexity. Some of the relations subsisting between individuals are susceptible of organisation, and thus form the basis of associations and institutions, others are too subtle, personal and delicate and escape organisation, others again are too vague to be formulated but are partly expressed in popular movements or tendencies, in public opinion and the like. These relations can only be understood in terms of mind, *i.e.* they rest upon impulses, ideas and purposes '.[1]

The particular ' network of individuals ' which interests us is the school. What relations within the school are strong enough to become institutions?—the prefect system, school societies and teams, the formal relations between staff and pupils, and the authority vested in the head teacher.

What of the more subtle and delicate personal relations that escape organisation? Here we enter the classroom and playground—the friendships, cliques and rivalries that are an essential part of school life. There are also the relations between teacher and taught, rapport and the elements that make up good classroom relations. On the negative side there are the failures to establish contact and confidence, the instances of victimisation, and the fears and apathies of retarded pupils.

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[1] Ginsberg, M., *Psychology of Society* (Methuen, London)

Then there are vague, more massive and permanent tendencies such as the corporate life of a school, the behaviour of its pupils in public and the attitude of a school towards its head. Similarly there is the prejudice of a soccer school against rugger. These are instances of attitudes. They appear to be so general throughout the whole school that we may be in danger of thinking of a group life over and above the existence of individuals. That is not so. The group is composed of persons each of whom is *unique*, conscious of himself as a single entity (see Chapter V) and ' whose nature is not exhausted in his membership of these wholes '. Occasionally society may even be *poorer* than the sum total of the potentialities and being of each person in it. The behaviour of a large football crowd, the onlookers at a procession, or a mob, illustrates how much poorer group action may be than the sum of the capacities of its human elements.

The teacher is especially interested in such groups as the class, club, school society, team, family and church. The school *class* and *football team* are taken below as examples, and some problems are enumerated in connection with (i) the relations between individual and group, and (ii) the structure of group life and morale.

THE CLASS

(i) *The relation of individual pupil to the whole class*
    (*a*) The pupil's response in an industrious class
    (*b*) The pupil's response when the class is in disciplinary trouble
    (*c*) His behaviour when the class is changed in composition
    (*d*) His participation in class decisions
    (*e*) His attitude to derision or admiration from the class
(ii) *The dynamic structure of the class*
    (*a*) The pattern of cliques in the class
    (*b*) The existence of isolated individuals

- (*c*) The morale of the class
- (*d*) Its manner of reaching group decisions
- (*e*) The hierarchy of its members
- (*f*) Its response to punishment by teachers
- (*g*) Its overall response to school and staff

THE SCHOOL FOOTBALL TEAM

- (i) *The individual player and the team*
  - (*a*) A player's response as his team is winning or losing
  - (*b*) His co-operation with other members of the team
  - (*c*) His efforts to raise morale
  - (*d*) His response to criticism by team mates or captain
- (ii) *Team action and spirit*
  - (*a*) How the team rallies against defeat
  - (*b*) How authority is respected in the team
  - (*c*) The relationship between forwards and backs
  - (*d*) Team morale

We may now turn to a more detailed study of the person in society, taking first the relation of individual to group, then problems of attitudes, and lastly those of social learning.

(ii) *The Individual and the Group*

The relationship between a person and the groups which form his social milieu is determined largely by forces we have already discussed. He perceives the world and acquires new social skills and knowledge in the same way as he learns bodily skills and classroom knowledge. We discussed the modes of learning in Chapters II, III, IV and V. Gestalt psychology tells us of the *structural* factors which determine what we perceive and learn. These structural factors arise from the nature of perception, the spatial relations between the different parts and the relation of figure to ground.

However other factors exert more powerful influence in *social* experiences and behaviour. They originate in the emotional aspect of learning. If a person has had pleasant experiences he looks forward to future happenings, but if he has had unpleasant associations he may tend to *avoid* future happenings. So, all that we are *willing* to perceive and learn depends on motivation and motives. These are called *functional* factors. We discussed the importance of such selection through the agency of need-satisfaction and motivation in Chapter V. In the chapters on learning we referred to pupil-teacher relations and pupil-attitudes. More will be said of these attitudes shortly.

The structural and functional factors that determine a person's social response themselves originate partly in the *person*, in response to his psychological limitations and needs. These include the internal facts of perception and personal needs and drives. But the functional factors also originate in the *culture* to which the person belongs. The standards of society and the customs and objectives of the groups with which the person communicates all influence his actions. He needs social approval for most of what he does. Our remarks on the factors promoting a change in level of aspiration reveal a similar double origin.

In Chapter XII we discussed the requirements an individual has of society. Group life, whether in the classroom, playground, home or factory, must provide an outlet for its members' needs for security, responsibility and adventure. Several theories were evoked to explain the nature of the individual's social life. McDougall[1] laid emphasis on the place of instincts and relied in particular on the instincts of gregariousness, parental love, reproduction and self-assertion. In terms of these instincts he explained such socialised reactions as the attitude of the individual towards his country and his sentiments towards religion and other abstract values.

Freud explained a person's social responses largely in terms of the behaviour produced in the individual when his aggressiveness and sex tendencies were frustrated by the requirements of community life. In fact most of the civilised person's activity would be accounted for in terms of repressed libidinal urges. Such repression can be looked upon as the price the individual pays for social life.

Lewin,[2] on the other hand, restricted his explanations to contemporary needs in the person's life. He avoided the historical explanation of Freud and would only evoke Freudian concepts in so far as they bear on the present life of the individual. His field psychology provides us with a diagrammatic way of representing the individual in his social setting. The social setting is called the field and it includes all that affects the child now—psychologically, socially and physically.

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[1] McDougall, W., *Introduction to Social Psychology* (Methuen, London)

[2] See the Reading List

We may take an example. The child has been forbidden to touch sweets which are contained in a box in the room in which he is playing. The child is affected psychologically by the desire to eat the sweets. The physical element in the field may consist of the cupboard in which the sweets have been placed, which prevents the child from reaching them. The social element may consist of other children who are playing with him at the same time and who would tell his mother if he attempted to touch the sweets.

Similarly, the individual members of a tutorial group live in a field which is defined in these three ways. An individual member may feel some trepidation when it is his turn to put a point or may feel some impatience that he is not allowed to talk more frequently. These would be psychological elements in the field. The social elements concern the relationship between the person and the rest of the group, and their physical field is limited by the room in which they work and the chairs on which they are sitting.

Lewin said that ' everything which affects behaviour at a given time should be represented in the field existing at that time, and that only those facts can affect behaviour which are part of the present field '. He included such concepts as locomotion (psychological, social and physical), force, position in the field, field boundary, barrier, goal, and structure of life space. He made use of other concepts as well, but this list will do for our purpose. By locomotion is meant not merely physical movement ; if a man achieves membership of a valued society, that would be described as social locomotion.

Lewin's field psychology or ' topology ' may be little more than describing and simplifying social events, but it is none the less useful in directing our attention to the relatedness of the individual to his social environment. Too often the educationalist tends to abstract the child from his home and class background, whereas the real unit is a *child in a social milieu*.

(iii) *The Cognitive Content of Attitudes*

An attitude is 'an enduring organisation of motives, perceptions and emotions with respect to some aspect of the individual's world'. Little distinguishes it from a sentiment, for, as we have seen in Chapter XII, sentiments are constellations of emotions and instinctive tendencies about certain objects and ideals. Personality has been defined as a constellation of social attitudes, and here similarly we have an idea closely resembling McDougall's master sentiment—the self-regarding sentiment.

Attitudes provide the 'frames of reference' for the conduct of a person's life; all that he thinks, feels, sees and does is consistent with this reference. The phrase 'frame of reference' is appropriate since it expresses the function of an attitude, how it determines the particular properties of any situation to which a person may respond. These properties, percepts and concepts, make up the cognitive content of the attitude.

Attitudes determine the course of social learning as, for example, when our attitude towards Communists, the Salvation Army or the Royal Navy, determines the kind of things we learn and are prepared to accept about these people on any future occasion. Similarly an intense patriotic attitude will also colour the facts one is prepared to learn about the relation of the British Commonwealth of Nations to the rest of the world. This role of attitudes in determining the course of subsequent learning is not always detrimental. The intense patriotic attitude in times of national disaster and threat to national existence, such as occurred in this country in 1940, serves a real purpose in blinding people's eyes to defeat. Winston Churchill's speeches during the early part of the war all served to enhance such useful, nay essential, prejudice.

In industry one of the chief hindrances to improvement of industrial design is found in the attitude of workers who may not be prepared to *see* the advantages of the new methods.

School teachers are more prone to neglect the role of attitudes in learning than they are to fail to recognise individual differences in ability and attainment. Many able teachers, masters of their subject matter and sensitive to the intellectual differences of their pupils, overlook the function of attitudes in connection with failure by the child, harsh treatment and thoughtless rebuff and later apathy in the pupil. They see their subject matter and pupils only in relation to the personal frame of reference, largely made up of unbounded enthusiasm for their subject. Much of the trouble in the case of backward children who are not innately dull, and delinquent children, is capable of explanation in terms of attitude psychology. Such pupils do not want to learn and refuse to face up to the school situation. Almost unconsciously they select the percepts and concepts they want to learn, and these do not amount to very much. Similarly the teacher may see only the undesirable traits of the difficult child, who himself may see all the teacher's bad points.

Prejudice and attitudes not only serve as frames of reference, but are also *learned*, and so one end-point of social learning is the formation of social attitudes. We may go further and say that the most important fact which a theory of social learning has to explain is the formation of prejudice and attitudes. The business of social learning is to change the content of attitudes—to introduce new percepts and concepts.

Once formed, an attitude is very resistant to change. Explanation, unconditioning and rational analysis of its wrongness are not enough, for the attitude produces such changes in the individual as to lead him to defend it by all sorts of substitution, avoidance and rationalising. We have the example quoted by Krech and Crutchfield of the effect of the series of ' Mr Biggott ' cartoons on people holding wrong social attitudes. The original hope was that the cartoons would lead to reformation of the persons' views. What happened, however, was that the persons refused to see themselves lampooned in the cartoons and explained away the content of the drawings by all sorts of rationalisation. Similarly it is difficult to change the content of the attitude of a retarded or maladjusted child. We have outlined this problem in Chapter VI.

Therefore, when we discuss the relationship between social learning and the contents of attitudes, we have to keep two things in mind : first, the fact that prejudice acts as a frame of reference in relation to the future course of social learning ; and, secondly, that a theory of social learning must explain the formation of attitudes and prejudices and also give an explanation of their resistance to change.

(iv) *The Emotional Basis of Attitudes*

Nothing short of an attack on the *need* served by the attitude will bring about a change in its content. It is not so much a matter of attack as of *changing* a need. It often takes a serious national crisis to demonstrate the force of this argument. The apathy and irresponsibility of people in normal times is suddenly changed when more basic needs are threatened by new disasters or with cultural extinction. The real fact of the matter is simply that *no attitude exists unless it meets a need.*

There are two clearly distinguishable levels at which social behaviour is motivated—both having great significance for the psychology of attitudes. The first is at the level of primitive needs and appetites, and the second is at the higher level of self-commitment. In the case of the latter the learner is *actively* engaged in the task in hand, is aware of his goal and sets his future aspirations in accordance with his previous experience.

We have seen that learning will tend not to be reinforced unless a need is satisfied. This same condition applies also to the formation of attitudes. An attitude is not merely a habit induced by propaganda. In order to be effective, propaganda and advertising must satisfy a need. The main problem for the advertiser is either to adjust his selling campaign to existing needs or to induce a new need in his public.

Those needs which are properties of the *immediate* social field surrounding the person, including psychological, social and physical elements, are more relevant to the study of attitudes than the remote needs of infancy and childhood which play such an important part in psychoanalytic theory. I am not denying the infantile origin of many adult social needs, but I am suggesting that for the purpose of attitude research we need only refer to the *present* manifestation of the need. We do not help by referring this in turn to events which may have lost causal connection with the present needs.

In addition to the appetitive needs there are the social needs of recognition, responsibility and adventure, which first appear early in childhood. The prestige of the teacher, parson, product or political party is an important requirement for these needs to be reduced and hence for mass-learning to take place. The child *needs* the approval of a respected person but not that of a despised one. Similarly the advertiser and propagandist must be in a position of prestige before they can begin to reduce a need.

Learning by the masses by the instrument of the press, the radio, television, advertising and the cinema is almost entirely of this kind. In fact the extent to which the prestige-need supplied by a dictator can be developed was very noticeable in Nazi Germany.

As much of the activity of ordinary men and women is governed by mere reinforcement and by need reduction, and it should be our business as educators to develop more active and rational forms of learning as soon as the situation permits.

A man may react in a neutral, routine, detached manner, or he may be personally, seriously, excitedly committed to the work in hand. Our self-feeling enters when our capacities are challenged. We become involved in social situations because of threat to or enhancement of our position. The job of the advertiser and propagandist, the parson and teacher, at this higher level, is to *involve* people in required action.

Experiments have confirmed that character traits such as honesty or tidiness are general, that is, applied by the individual to every situation only in so far as the individual is fully committed to the concept of honesty. When not involved the person is liable to be honest only in a very irregular expedient manner. This observation has some bearing on the training of good moral habits. Transfer of training will take place only if the child is fully committed.

We may summarise this outline of the emotional basis of prejudice by noting that highly organised attitudes depend on involved behaviour for their formation. The emotional sources of such attitudes have the property of *motives* rather than *motivation*. On the other hand the uncritical prejudice held by many ordinary people about topical events and phenomena may be motivated in large part by the satisfaction of simple biological and social needs.

(v) *Social Learning*

We have dealt with attitudes as frames of reference and we now turn to the second problem, that of finding a learning theory sufficiently broad to explain not only the more specific learning in the classroom but also the broader learnings we call social attitudes. ' Learning has to be viewed as the process of socialisation of the child and a prerequisite for social participation of the adult.' We require a theory of social learning that will explain the development of personal responsibility, democratic and autocratic behaviour, insight into the complexities of modern life and moral action and values.

Learning as a change in experience has been effectively studied by the gestalt psychologists. According to their views, learning is the ' reorganisation ' of experience, consisting of perceptions and cognitions, the reorganising agents being the ' good ' gestalts and insights. However, as we have seen, we need to go beyond cognitive and perceptual factors to give a fuller account of the unifying principle we know as a social attitude. We must look for social and emotional factors.

The other side of learning is seen in change of behaviour. The stimulus-response research and theories of Thorndike, Pavlov, and Hull on behaviour changes often take account only of simple situations in which the reinforcing agent, bringing about learning, is a mechanical stimulus. A theory of social behaviour should account for the fact that the reinforcing agents are individuals and groups of individuals, who by their reactions to the learner provide him with active feedback and reinforcement, as described by Skinner[1] in relation to verbal learning.

(vi) *Leader and Led*

The role of leadership of a group is one example of the relationship between individual and group and is of special interest to the teacher since he has to lead his pupils. Furthermore it is commonly asserted that the main purpose of grammar school education is to produce leaders.

What are the effects of different kinds of leadership on the groups led? A significant research was carried out by Lippitt and White which suggested an answer to this question. They investigated the effects of three kinds of leadership on the activities and attitudes of small groups of boys. The kinds of leadership were called authoritarian, democratic and laissez-faire. The groups were each made up of five boys. Each group carried out communal tasks, making a plaster cast, carving from soap and making a wooden model.

The three types of leadership were defined as shown in table overleaf. Recordings were made of all that was said and done by the groups during the leaders' presence *and* absence. The main findings were as follows.

The *work* of the group which was led in an authoritarian manner was less constructive than that of the democratic group but more so than that of the laissez-faire group. Work in the authoritarian group fell off sharply when the leader was absent. The attitudes of the members of the authoritarian group towards each other were aggressive, which was more marked when the leader was absent, even to the extent of finding scape-goats. Their responses to the leader were submissive, and their requests of him were attention-demanding and competitive. There was also more *I*-feeling than *We*-feeling.

In the democratically led group there was evidence of much more *We*-feeling as opposed to *I*-feeling, and when obstacles were met in the work situation the democratic group responded by organised attacks on the work. In the authoritarian group such difficulties tended more to lead to recrimination and blame. The approaches to the leader were friendly, non-competitive and work-minded.

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[1] Skinner, B. F., *Verbal Behavior* (Methuen, 1957)

The laissez-faire group was least constructive and led to the same attitudes as appeared in the authoritarian group. Frustration caused by ignorance led to considerable regression. Overall this type of leadership is least to be recommended, whilst authoritarian leadership may be necessary at first with insecure people.

Different kinds of leadership

Authoritarian	Democratic	Laissez-Faire
1. All determination of policy by the leader	1. All policies a matter of group discussion and decision, encouraged and assisted by the leader	1. Complete freedom for group or individual decision, with a minimum of leader participation
2. Techniques and activity steps dictated by the leader, one at a time, so that future steps were always uncertain to a large degree	2. Activity perspective gained during discussion period. General steps to group goal sketched, and, where technical advice was needed, the leader suggested two or more alternative procedures from which choice could be made	2. Various materials supplied by the leader, who made it clear that he would supply information when asked. He took no other part in work discussion
3. The leader usually dictated the particular work-task and work-companion of each member	3. The members were free to work with whomever they chose, and the division of tasks was left to the group	3. Complete non-participation of the leader
4. The leader tended to be personal in his praise and criticism of the work of each member; remained aloof from active group participation except when demonstrating	4. The leader was objective or 'fact-minded' in his praise and criticism and tried to be a regular group member in spirit without doing too much of the work	4. Infrequent spontaneous comments by leader on member activities unless questioned, and no attempt to appraise or regulate the course of events

This study of leadership also demonstrates how readily the group imitates the methods used by the leader. For children brought up in friendly and sympathetic families, fulfilling the suggestions made by Fleming, there is no doubt that democratic leadership yields the best results. If, however, children have been used to an authoritarian upbringing and culture, the way to democratic leadership may be easier via the authoritarian approach.

If the reader consults the verbatim reports of the groups' activities (see Lippitt and White in the Reading List) he will see how the results may also help us to set down some of the *functions* of leadership. The leader is the expert, in part the planner and policy-maker, and he has also executive responsibilities. He should maintain morale and desirable internal relationships within the group. He is the arbitrator and mediator and the giver of rewards and punishments. Some of these things he may emphasise or neglect according to whether he leads in a democratic or authoritarian way.

What are the characteristics of good leaders? It has been maintained that every person may be a leader in the correct group. One is a leader on the football field but a shy nonentity on the dance floor. Another is the authority on nature study but a drone in the gymnasium. The martinet at work is the meek husband at home. There is, however, much evidence that people who tend to lead in one group will more than likely turn out to be the leaders in others. There is such a person as the dominant individual. Persons with high needs for prestige and power, particularly when these needs are satisfied by controlling interpersonal relations, are likely to make leaders.

On the other hand the skills of leadership and the required attitudes of leaders to their groups are learned, and the *intelligent* leader learns more quickly. The leadership of a class of backward 14-year-olds, of a group of boys in an approved school, and of a senior class in a grammar school, calls in each case for different skills and attitudes on the part of the leader. British teachers who have gone from the relatively authoritarian atmosphere of our schools for a short spell of teaching in the U.S.A. where the atmosphere in the schools is freer, testify to the same needs to learn new teaching skills and attitudes. The same change may be seen when a class of pupils is taken by their teacher, say, to visit a museum or exhibition.

The relationship between the teacher and the class changes subtly. The skills and attitudes of leadership can be trained and a useful way is to allow the leader to experience some of the problems of leading a small group. Psycho-drama is one such technique in which one man acts the leader role and a colleague the role of subordinate person.

Lastly a leader must be accepted by his group. He must be perceived by the members of the group as a *leader*. He must look like a leader and seem convincing, persuasive, confident and competent. The reader may have noticed that biographies, stories of travel, exploration and war adventures bring out these qualities, for often the groups involved are small and the conditions of group existence so dangerous and trying that the qualities of both leader and led are revealed in high relief.

(vii) *Morale and Group Life*

The essential test of a good leader is the morale of the group he leads.

When does a group possess high morale? When it tends to hold together through internal cohesiveness rather than through compulsion from outside, when it is not divided against itself, when a feeling of confidence is felt by each member for all the others and the leader, and when all feel a real need to achieve the goal of the group. Other signs of high morale include the adaptability of the group to changing situations, the tendency for the aims of individual members to be compatible with the group objectives, and the desire of members to retain the group.

We may apply these criteria of high morale to the example of a professional football team. The team does better when it holds together with inner force rather than because of threats and orders from the directors, manager and fans. A win is the real need of every individual. A good team adapts itself quickly to the loss of a player by injury or changes in the run of the game. Last but not least, individual players do not tend to seek transfer when morale is high.

Similarly the reader may analyse the tragic story of Scott's journey to the South Pole. All the above qualities were revealed in the small group of explorers right up to the end.

Factors which promote high group morale include a clear-cut goal and an awareness of progress towards that goal. Failure to recognise these requirements has had much to do with the relatively low morale in some secondary modern schools. This low morale may be characteristic not only of pupils and parents but also of teachers. Some schools took a long time to define their goals clearly, but recent changes are doing much to change this state of affairs.

Also, each member should feel that all others are pulling their weight. Each should be fully involved in the task in hand and a feeling of one-ness and solidarity should characterise the attitudes of each individual.

When outside influences change, the internal cohesion of the group and its adaptability are both capable of measurement. This is done by applying *sociometric* tests. Moreno [1] first invented the science of sociometrics and since then much research has been conducted on empirical study of group life or theoretical problems relating to sociometric indices. A sociometric test is exceedingly simple. Each member of a group is asked privately who are his friends, whom he likes to work with, whom he talks to, and the like. He may be

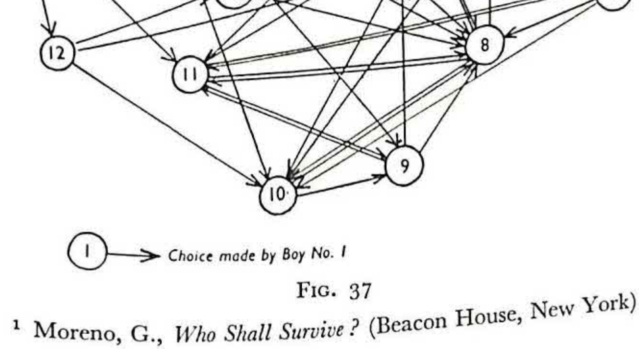

FIG. 37

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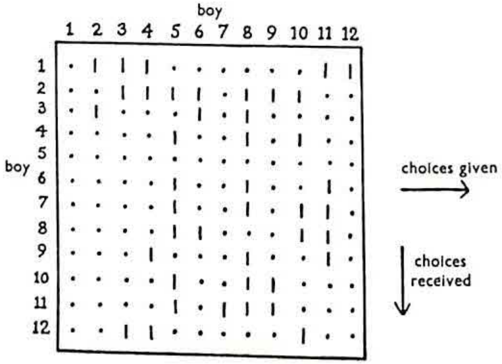
[1] Moreno, G., *Who Shall Survive?* (Beacon House, New York)

asked to name those he does not like. The results are then combined for the group on the sociogram. Fig. 37 shows one expressing the dormitory preferences of a group of twelve boys in a home for maladjusted adolescents.

The sociogram in Fig. 37 may also be presented as a *sociomatrix* (Figure 38).

By means of these diagrams we may obtain an overall view of the 'cohesion' by the total number of choices given. We may detect weak parts of the group structure such as revealed in Boy 1, who receives no choice (called an isolate), *i.e.* no-one wants him as a dormitory companion. We may find popular boys, as Boy 8 (a star), and mutual friendships such as 2-3, 8-10 and 7-11. By a study of the sociogram and sociomatrix we may detect undesirable qualities of group life and make the necessary changes to raise morale. Sociometric indices have been devised[1] by which the interactivity, cohesion, stability and other properties of the group may be measured from the sociogram or sociomatrix.

CHOICE OF DORMITORY COMPANIONS



boy	1	2	3	4	5	6	7	8	9	10	11	12
1	·	|	|	|	·	·	·	·	·	·	|	|
2	·	·	|	|	|	|	·	|	|	|	·	·
3	·	|	·	·	·	|	·	|	·	·	·	·
4	·	·	·	·	|	·	·	|	·	|	·	·
5	·	·	·	·	·	·	·	·	·	·	·	·
6	·	·	·	·	|	·	·	|	·	·	|	·
7	·	·	·	·	|	·	·	|	·	|	|	·
8	·	·	·	·	|	|	·	·	·	|	|	·
9	·	·	·	|	·	·	·	|	·	·	|	·
10	·	·	·	·	|	·	·	|	|	·	·	·
11	·	·	·	·	|	·	|	|	|	·	·	·
12	·	·	|	|	·	·	·	·	·	|	·	·

choices given →
↓ choices received

FIG. 38

Group dynamics is the science which investigates how the group structure changes under dynamic forces from within or without. It treats of the adaptability of the group. Sociometric tests are applied on different occasions or to different groups in order to relate changes of structure to outside variables.

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[1] Lundberg, G., *Social Research* (Longmans, New York)

(viii) *Reading List*

DEWEY, J. *Democracy and Education* (Macmillan, New York).

LEWIS, M. M. *The Importance of Illiteracy* (Harrap, London).

GINSBERG, M. *Psychology of Society* (Methuen, London).

KRECH, D. and CRUTCHFIELD, R. S. *Theory and Problems of Social Psychology* (McGraw-Hill, New York).

FLEMING, C. M. *Social Psychology of Education* (Routledge, Kegan Paul, London).

McDOUGALL, W. *Introduction to Social Psychology* (Methuen, London).

BROWN, J. F. *Psychology and the Social Order* (McGraw-Hill, New York).

FRIEDMANN, O. *Social Psychology* (Sylvan Press, London).

LEWIN, K. *Principles of Topological Psychology* (McGraw-Hill, New York).

LEWIN, K. Chapter 16 in *Manual of Child Psychology*, ed. Carmichael, L. (Wiley, New York).

LEWIN, K. *Resolving Social Conflicts* (Harper, New York).

SHERIF, M. and CANTRIL, H. *Psychology of Ego-Involvements* (Wiley, New York).

LUNDBERG, G. *Social Research* (Longmans, New York).

LIPPITT, R. and WHITE, R. K. 'The Social Climate of Children's Groups', Ch. XXVIII in *Child Behaviour and Development*, ed. Barker, R. G., Kounin, J. S. and Wright, H. E. (McGraw-Hill, New York).

MORENO, G. *Who Shall Survive?* (Beacon House, New York).

SHAW, H. 'A Study of Popular and Unpopular Children', *Educ. Rev.* Vol. 6, No. 3, June 1954.

SMITH, F. V. *The Explanation of Human Behaviour* Ch. 7 (Constable, London).

SKINNER, B. F. *Verbal Behavior* (Methuen, 1957).

(ix) *Exercises*

1. Taking the family as the group, enumerate a list of problems concerning the relation between the family and one of its members, *e.g.*

   (*a*) the relationship of the youngest child to the rest of the family,

   (*b*) the role of the wage earner.

2. Enumerate a list of topics on the structure and morale of family life. For example

   (*a*) the adjustment of structure when a new child arrives into the family,

   (*b*) the structure when poverty threatens,

   (*c*) the way in which authority is vested.

3. Discuss the role of attitudes towards learning in relation to school progress.

4. Comment on the relationship of

   (*a*) the prestige of the teacher to learning,

   (*b*) the prestige of a manufacturing firm to purchase of its goods.

5. Recall a good and a bad leader whom you may have met and make a list of some of their actions which contributed towards their respective powers of leadership.

CHAPTER XV

SCHOOL EXAMINATIONS

(i) *Introduction* (ii) *Secondary school entry examinations* (iii) *Conditions which a selective examination should fulfil* (iv) *English composition* (v) *Flexibility* (vi) *Unwanted consequences of the predictive examination* (vii) *Secondary school leaving examinations* (viii) *Advantages* (ix) *Disadvantages and suggestions* (x) *Reading list* (xi) *Exercises*

(i) *Introduction*

SCHOOL examinations are closely related to the topic of Chapter IX, for one kind of examination is designed to classify pupils according to their different abilities and attainments. Examples are the entry examinations for secondary education and the examinations taken in the sixth form of the grammar school for entry to the university. Such examinations are *selective* and *predictive*. These examinations differ in that the grammar school entry examination, unlike the General Certificate of Education at the advanced level, is not based on an agreed syllabus.

But not all examinations are intended to grade pupils according to individual differences. Some are concerned primarily with recording stages of development in the pupils' learning and attainments. Such is the General Certificate of Education at the ordinary level. As, however, even in these examinations the problem of differences in attainment is also involved we shall discuss both kinds of examination in the present chapter.

There are, therefore, two ways of describing examinations: firstly, according to whether they *predict* on the basis of individual differences or *record* a stage of development; and secondly, whether or not they are based on an agreed syllabus.

We may represent this cross-classification in the following way.

	Predictive	Record of Development
Based on a syllabus	G.C.E. Advanced and Scholarship Levels. Scholars to university	G.C.E. Ordinary Level
Free from a syllabus	11+ classification for secondary education	

Selection examinations began at the end of the nineteenth century as the means of awarding a few local authority scholarships to enable the children of poorer parents to climb the educational ladder. Grammar school leaving examinations have a longer history. Their development is characterised by the dual purpose of providing a leaving certificate recording a standard of achievement, and of selecting those capable of gaining from a university career.

The present dominance of selection examinations may well cause us to pause to take stock of what we have achieved. Educators began by using examinations as a tool but have now in a very real sense reached the stage in which examinations determine the course of education. In this chapter we shall look at examinations from the point of view of educational psychology and set out the advantages, limitations and undesired consequences of their use.

The predictive examination, not based on a syllabus, is now used almost exclusively in England for selection for secondary education. Its important components are tests or examinations in arithmetic and English. Each Local Education Authority is responsible for its own examinations. Often the entire examination is standardised, and a standardised intelligence test is almost universally used. Frequently tests of more special abilities may also be included. In the case of *attainment* tests and examinations the examiners endeavour to make use of attainment in the primary schools *without prescribing what curriculum the primary school shall follow*. This leads to one of the greatest difficulties in this type of examination, for it appears impossible to set papers whose contents will not eventually affect syllabuses.

It may be that we are attempting something impossible in this admirable endeavour to forecast progress without disturbing the earlier content of the education from which the forecast is derived. Few would wish to limit the content of the school course for children between 7 and 11 to basic subjects only, and still fewer would want to limit the basic subjects to the narrow concepts of English and arithmetic, as embodied in objective tests. Furthermore, as we have seen in Chapter VIII, performance in tests of innate ability is itself susceptible to teaching influences. Lastly, the content of the primary school syllabus is much simpler than the content of the Grammar School course, where new subjects are introduced. This leads us to further difficulties in our attempts to use the examination to forecast aptitude for *new* subject matter. We see, therefore, that the secondary school entry examination carries with it inherent psychological and methodological difficulties [1] which cannot be met solely by the administrator.

The chief difficulty encountered in conducting the secondary school leaving examinations is to ensure that the General Certificate of Education at the ordinary level serves as a record of attainment. The history of its predecessor, the School Certificate examination, shows how easy it is for this examination to become competitive. On the other hand the General Certificate of Education at the advanced and scholarship levels has to serve as a selective and predictive examination for entry to the universities and other higher institutions.

(ii) *The Secondary School Entry Examination*

Many of the problems we now have to face were clearly envisaged in early Board of Education reports, namely, the danger of special preparation, consideration of borderline cases, need of follow-up studies, and the need to test capacity to profit rather than attainment. The use of intelligence tests to supplement the English and arithmetic papers was pressed in the Board's *Report of Psychological Tests of Educability* in 1924, and school records were also mentioned as a source of information for the selector. In 1928 a pamphlet[1] on *Free Place Examinations* suggested that English and arithmetic papers should be based on a minimum syllabus, recorded a fall in confidence in the essay, and recommended that standardisation and allowance for age should be carried out. The Hadow Report (1931) warned against the distortion of the primary school curriculum by any form of test and tied this up with the tendency to judge primary schools by the number of free places won. In 1936 in a further statement[2] the effects of the special place examination on the junior school are considered to be a criterion of the relative failure or success of the examination.

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[1] Much popular criticism against the examinations should be concerned with the *need* for an examination. As long as 'equality of educational opportunity' entails prediction of those likely to gain from certain kinds of secondary education, then an examination is necessary. Whatever its content it would lead to malpractice. The idea of comprehensive education somewhat diminishes the need, but even here reliable and objective test procedure may be required for internal purpose.

The germs of the concept of the secondary school entrance examination as a means of allocating pupils to different streams in a single secondary stage of education are really first present in the Spens Report on Secondary Education (1938), and it is at this point that the present practice emerges. The Norwood Report (1943) first gave clear formulation of a principle for allocating children to different parts of the secondary stage of education according to 'age, ability and aptitudes'. It recommended a flexible age of entry round about 11+ and also emphasised the need for discovering special abilities, the importance of school records and a reconsideration of the 11+ decision at 13+ to rectify possible errors in placing. In the years immediately following the 1944 Act many attempts were made to realise these principles. But earlier doubts began to reappear concerning the narrow nature of the attainment tests, the lack of a place for written English, the susceptibility of intelligence tests to coaching and practice, and the predictive power of the examination.

Nowadays some or all of the following sources of information may be used by different local authorities (N.U.T. Report App. I) : objective tests of attainment and ability ; written examinations ; cumulative school records ; and personality assessments.

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[1] Pamphlet 63 (Board of Education, 1928)

[2] Supplementary Pamphlet 63 (Board of Education, 1936)

Interview panels are often used for borderline cases. Suggestions have been made for widening the basis of the technical selection examination to include creative tasks and interests.[1]

The age at which the examination is taken, between 10 and 11, has given rise to much criticism and discussion, but the evidence for general and group factors of intelligence, particularly verbal factors and spatial-practical factors, around 11-13 is very convincing (see Chapters VII, VIII and IX). These appear sufficiently marked at 11 to permit of selection for grammar and technical schools, provided some small attention is given to information other than ability and attainment tests, such as interests, primary school records and creative tasks.

The question of the best age for the entrance examination for secondary schools is tied up with the flexibility of the secondary school system. The common school course recommended in the first two years of secondary education makes for early initial selection and subsequent transfer at 13. Excessive transfer at 13+ is undesirable, but there is evidence that late entries to grammar schools, when allowed an extra year, perform on average nearly as well in the school certificate examination as the normal 11+ entrants. Pupils transferred to the secondary modern school are often happier and less subject to the emotional stress associated with failure to maintain the higher academic standard of the grammar schools.

There is a growing view that 13 would be a desirable age at which to start secondary education. This would link very well with what we know about the pupil's intellectual development (see E. A. Peel, *The Pupil's Thinking*, Oldbourne Press, 1967, Chapter V).

A few examples of the procedures adopted by Local

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[1] Peel, E. A., 'Selection for Technical Education' *Ed. Rev.* Vol. 4, No. 3, June 1952

Authorities are listed below in order to illustrate the variety of procedure. The standardised intelligence test is the only common element used.[1]

A. Uses objective tests at 11+ in English, arithmetic, verbal and non-verbal intelligence. Primary school records and 7+ attainment and ability tests are used in conjunction with special individual tests devised for use by area interviewing panels.

B. Uses objective tests in English, arithmetic, verbal and non-verbal intelligence tests at 11+.

C. Ordinary English and arithmetic examinations and an intelligence test at 11+.

D. Objective tests of English, arithmetic, intelligence (two tests), English essay and school records at 10-11.

E. Uses an intelligence test to determine the *number* of children in each primary school who will be offered places in grammar schools. School examinations and recommendations to determine *which* children shall enter the grammar schools.

F. Uses objective English, arithmetic and intelligence tests, together with English essay. Borderline group interviewed by small panels at which individual tests are undertaken.

(iii) *Conditions which a Selective Examination should Fulfil*

(*a*) We should expect that performance in a selective examination would correlate highly with later performance in the secondary school. There are two factors which cause an examination to fail in this respect. It may not be sufficiently reliable. A child's performance in the test on different occasions may vary excessively. Unreliable elements in an examination are those due to lack of objectivity in marking and ambiguity in its questions. Besides being unreliable an examination may not use information available at the end of the primary school stage which is of value in predicting future progress. Thus an objective intelligence test alone, which is normally a very reliable form of examination, may not sample sufficiently the tasks and attainments acquired during the primary school years and also those relevant to achievement in the secondary school. Therefore, when assessing the total predictive power of the examination, we have to keep in mind its scope (or validity) and its reliability.

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[1] A few Local Authorities have at times dispensed with the intelligence test, relying solely on attainment tests.

(*b*) Secondly the examination should be sufficiently flexible to permit of special educational procedures for borderline cases and for cases of nervousness and any other case of discrepancy between the examination and recommendations of teachers and others who know the child well. By flexibility is meant the use, if required, of additional, more individual methods to check the evidence of the main examination. If we make such allowance we are in a better position to give information about doubtful and exceptional candidates.

(*c*) Lastly it should command the confidence of parents and should appear to be fair and relevant. It should not lead the teacher to embarrassment in his relations with parents who may be ambitious for their children's progress. It should lift awkward responsibilities from the teacher.

There is much evidence that the 11 + examination predicts grammar school progress successfully. The method used in all investigations consists simply of comparing the results of the entry examination with the results of later achievements, whether estimated by examinations, teachers' assessments or further tests, and the predictive power of the entry examination is given by the correlation between these two sets of data. The enquiry into the qualifying examination for Scottish secondary schools [1] attempted to answer the following questions.

> What are the relative predictive values of
>
> (*a*) ordinary examinations (*b*) teachers' estimates (*c*) group intelligence tests and (*d*) standardised scholastic tests ?
>
> What are the best combinations of the above measures in selecting pupils for secondary courses ?

Individually the four predictors correlated respectively with secondary school success as follows : (*a*) ·754, (*b*) ·730, (*c*) ·690, (*d*) ·701. The best battery for predicting secondary school success was made up of the intelligence quotient, the combined English and arithmetic marks in the qualifying examination, together with the teachers' estimate of English and arithmetic ($r = \cdot 808$). It is noteworthy also that all the best predicting batteries included the ordinary qualifying examination.

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[1] McClelland, W., *Selection for Secondary Education* (U.L.P., London)

An enquiry [1] conducted by the West Riding Education Authority has also shown that traditional scholarship examinations in English and arithmetic are slightly superior to objective tests in these subjects. These findings confirm an earlier enquiry when standardised tests of English and arithmetic were compared with ordinary English and arithmetic examinations. Little difference between the predictive power of the two examinations was found. But Emmett found that a standardised intelligence test gave a better indication of grammar school success, as estimated by the grammar schools three years after entry, than the combined ordinary tests of English and arithmetic. Rutter [2] also showed that a standardised intelligence test is a better predictor ($r = \cdot 5$ to $\cdot 7$) of a criterion composed of School Certificate English, geography and mathematics, than unstandardised tests of intelligence, arithmetic and English.

The predictive power of objective tests of English, arithmetic and intelligence has been compared. One early investigation showed that the English test best predicted School Certificate success five years later, that the intelligence test best predicted mathematics and physics, and that the arithmetic marks were of relatively less value in predicting mathematics. Later Peel and Rutter [3] used several schools, comparing standardised entry tests with School Certificate results, and found that intelligence was the best single predictor of achievement in the School Certificate examination, whether considered primarily from the arts or science side. The three entry tests considered as a team predicted School Certificate teams of English literature, English language, French and mathematics to the extent of ·59. The individual correlation between the entry tests and the School Certificate subjects compared closely with the correlations between the School Certificate subjects themselves. Emmett and Wilmut[1] also obtained similar figures with regard to a criterion of School Certificate English literature, English language, history, French and mathematics. They corrected for selection and obtained a prediction of ·84, and point out that the results of Peel and Rutter if also so correlated would yield a prediction of ·85.

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[1] Emmett, W. G., 'Secondary Modern and Grammar School Performance predicted by Tests given in Primary Schools' *B.J. Ed. Psych.* XXIV, p. 91, 1954

[2] Rutter, D., 'An Enquiry into the Predictive Value of the Grammar School Entrance Examination' *Research Review* I, p. 3, 1950

[3] Peel, E. A. and Rutter, D., 'The Predictive Value of the Entrance Examination as judged by the School Certificate Examination' *B.J. Ed. Psych.* XXI, p. 30, 1951

These results covering research over some fifteen years clearly confirm that *objective* tests are efficient for predicting grammar school selection at 11+, but they also show that scholastic attainment tests are slightly superior to standardised objective attainment tests. The value of the intelligence test is demonstrated in every research on this component of the entry examination.

The reliabilities[2] of objective tests of ability and attainment are very high. On the whole, verbal tests have reliabilities in the region of ·95 and upwards, whereas the reliabilities of the spatial tests usually range in the region ·90-·95 and sometimes fall slightly below ·90.

Objective tests offer reliability, but many question whether they take sufficient account of all that is available for prognostic purposes at the end of the primary school years. For this reason many authorities now insist on the inclusion of an English composition in the 11+ examination.

(iv) *English Composition*

Largely as a result of investigations[3] conducted in the thirties, the written papers and the English composition tended to fall into relative disrepute among those responsible for conducting secondary school entrance examinations. Now, however, it is more widely appreciated that objective tests do not assess the capacity to produce written English.

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[1] Emmett, W. G. and Wilmut, F. S., 'The Prediction of School Certificate Performance in Specific Subjects' *B.J. Ed. Psych.* XXII, p. 52, Feb. 1952

[2] *Test reliability.* The concept of test reliability is best considered by referring to the methods of measuring it. There are two well-known methods, one the test re-test method, and the other the split-half method. In the test re-test method the same test is applied to the same children on two occasions and the scores compared. This gives a measure of the consistency of the test over a period of time. In the split-half method the test is divided into two halves which are given to *one* group of children and so gives a measure of consistency between the items which is more independent of fluctuations in the testee's performance.

[3] Hartog, P. and Rhodes, E. C., *An Examination of Examinations* (Macmillan, London)

Most researches on written English have been designed to test the reliability of examinations or to assess the relative merits of analytical methods and overall-impression methods of marking. The International Examinations Inquiry showed how inconsistent the marking of essay type answers could be, but probably the inquiry exaggerated the weaknesses of essay type examinations for entry to secondary schools and tended to belittle their merits.

Soon more constructive research into methods of marking compositions appeared. Morrison and Vernon compared a method of marking which concentrated on formal expressive elements in the composition with the more conventional combination of the impressionistic-analytic marking. Both methods are very reliable, the mean correlations for the two teams of marks both being ·86. Average inter-correlations between the examiners were ·81 for the first method and ·72 for the second. Wiseman compared the analytic method with the general impression method due to Burt. He found very little difference between the results of using the two methods but recommends the general impression method since it is more speedy to apply. By pooling the marks of four examiners he obtained a reliability of ·90-·95. Finlayson pointed out that Wiseman failed to take account of the two components of consistency, namely, marker consistency and the fluctuation of the writing of the children from essay to essay. But even after allowing for these elements he gets a mean marker reliability of ·69. If three markers mark each of two essays produced by each child a reliability of ·88 is obtained. McMahon [1] and some unpublished work of mine also confirm this confidence in the essay.

Peel and Armstrong [2] investigated the relative predictive efficiency of an objective type English test and English composition in relation to later secondary school performance in English and a foreign language. They followed up pupils selected for eleven West Riding grammar schools and found that of the three tests, verbal intelligence, objective English, and English composition, the best single predictor was the verbal intelligence test, but that the best team of two examinations was a combination of verbal intelligence and English composition. Furthermore, when the effect of the objective test of English was added to this team, there was little significant gain in prediction.

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[1] McMahon, D., 'Educational Selection and Allocation' Ch. V in *Current Trends in British Psychology*, eds. Mace, C. A. and Vernon, P. E. (Methuen, London)

[2] Peel, E. A. and Armstrong, H. G., 'Symposium: The Use of Essays in Selection at 11+', 'II—The Predictive Power of the English Composition in the 11+ Examination', *B. J. Ed. Psych.* XXVI, Pt. III, 1956

In returning to the essay educational practice has not moved in a circle but rather in a spiral, for the attention given to this form of examination has undoubtedly produced more efficient methods of marking and examining by essays. It is clear that the price to be paid in objectivity and reliability for a gain on educational grounds may not be so high as previously thought. The beneficial effects on the primary school will be considered later.

(v) *Flexibility of the Examination : Cases of Doubtful and Borderline Candidates*

Even after a full examination has been given there may be doubtful cases, caused by illness, nervousness and special home and background conditions. These, together with the borderline zone, should be considered individually. The borderline group even in the case of a highly reliable battery of tests ($r = \cdot 98$) ranges something like 20 points in a mean total of 300 points of standardised score.[1] Some authorities conduct panels for interviewing individual children, using in addition various individual tasks in English, arithmetic and local studies, to obtain further knowledge of the child's potentialities, attainment and interests. Such panels include educational psychologists and head teachers of both primary and secondary schools. The information elicited should be quite different from that already obtained by objective tests and the like ; the methods too will of course be different

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[1] Pilliner, A. E. G., 'Position and Size of the Borderline Group in an Examination' *B.J. Ed. Psych.* XX, 1952

The children are only in the doubtful or borderline class because the methods already used have failed to produce the facts required.

(vi) *Unwanted Consequences of the Predictive Examination*

(*a*) *Effect on Curriculum*

The predictive selection examination aims at disturbing and influencing the primary school curriculum as little as possible, but we must now ask ourselves how far this aim is achieved. We have to admit that achievement falls far short of the aim. The question then arises as to whether this influence is beneficial or not. In the case of objective tests it is certainly not, as it results in a restriction of the approach to the teaching of English and arithmetic. The intelligence test forms an integral part of the predictive examination. As we have seen (Chapter VIII), intelligence tests are susceptible to training. Vernon's solution, that of introducing a short course of compulsory coaching preliminary to the examination, although realistic, is hard to justify on educational grounds.

What can we do about the influence of objective tests of attainment and ability on the primary school? The answer seems to be either Vernon's, in which a syllabus of intelligence, arithmetic and English would be laid down, or alternatively to ring the changes in the content and form of the examination. We have seen already that little price is paid in reliability by using normal examinations and teachers' estimates. Later research on English compositions has shown that team work can make this form of examination very reliable. Furthermore, the form and content of objective tests of attainment can be varied considerably. The same applies to tests of intelligence. If we hope to prevent the predictive selection examination from tying down the primary school syllabus we must change our procedure from year to year.

(*b*) *Emotional Effects on Parents and Children*

The selective examination for secondary education has emotional effects on parents and children. It shows itself in the transfer of anxiety from the parent to the child and in all kinds of behavioural reactions in the child—tenseness, poor performance, long periods of anxiety previous to and leading up to the examination. Little or no published research has appeared on this problem, but educational psychologists, whether working in clinics or as selection officers, report some cases of emotional strain. A few case studies, collected from the records of several local authorities, are given below to illustrate the nature of the problem. It is clear from these case studies that the problem of anxiety is more marked in the middle-class home.

Adverse effects of the selection examination for grammar schools

1. Boy (9·9). Father : a general medical practitioner.

Stanford-Binet I.Q. 163. Attending a private preparatory school after transfer from a day private school. Transfer due to father's feeling that the boy was not making sufficient progress to be likely to pass eleven-plus tests. Query : 'Should boy continue at present school and do extra work on the chance that he might make the grade, or should he be transferred to L.E.A. primary school now to soften transition to secondary modern school if he failed eleven-plus tests ?' Moray House tests gave A.Q. 136, E.Q. 133. Both tests at 9·9. Despite all reassurances on the basis of these results, boy worked so hard at school for tests, and such atmosphere of tension continued in home and school, that following official allocation tests and pass for grammar school, boy spent several weeks in bed with nervous breakdown. (Unnecessary anxiety in case of high I.Q. and excellent attainments.)

2. Boy (7·4). Father : a local government official.

Stanford-Binet I.Q. 95. Non-reader. Query : 'Should boy have coaching to get his scholarship at eleven ?' Given remedial teaching over about 9 months. Discharged with satisfactory reading attainment. Advised against coaching as not of grammar school potential. Mother arranged intensive coaching over some three years. Health and behaviour deteriorated. Boy sat allocation tests and obtained on all tests quotients within the range 95-105. (Impossible ambition.)

3. Girl (8·4). Father : a dock hand.

Stanford-Binet I.Q. 98. Query · 'Poor reader ; must get scholarship ; finding difficulty in holding her place in her class ('A'—scholarship class).' Girl had suffered from Pink disease as infant : had left her eyes weak ; great difficulty in reading. Taken completely out of class for about 6 months. Glasses obtained. Free play and psychotherapy to deal with severe nervousness and anxiety, depressed and inhibited feelings. Transferred to grade at appropriate level. Parents accepted 'no scholarship'. Child normal in adjustment and scholastic attainments, and made marked physical growth since. Follow-up over 3 years has confirmed. (Interesting as illustrative of scholarship ambitions in the most adverse circumstances.)

4. Girl (7·8). Father: a dispensing chemist.
Stanford-Binet I.Q. 85. Query: 'School holding child back: cannot read much yet; doing too much handwork, art, etc.; must get a scholarship.' General motor co-ordination much poorer than Binet I.Q. would lead to suppose. ? chorea. Difficult home behaviour; surmised reactive to physical disability plus home demands. Advised what may be hoped for, and what not: school taking excellent measures for child's future. (This case required major efforts of head teacher, psychologist and psychiatrist before parents would accept the facts: even yet doubtful in outcome, so great is the anxiety of parents for grammar school education.)

5. Girl (10·6). Father: grammar school teacher.
Stanford-Binet I.Q. 114 (probably overestimated). Query: 'Mother pressing father to "do something" about the girl not being allocated to grammar school.' All Moray House quotients in range 95-110. Very poor vocabulary; general verbal poverty; reading interest confined to American type comic. Pale, thin and anxious; tense and apprehensive; showing great strain; formerly suffered from nephritis, specially advised to avoid strain, but mother uses this as argument for high potential ability held back by school absences. Actually I.Q. tests of Binet type overestimate potential owing to favourable scholastic background and parental conversational opportunities. (It is interesting to notice here that apparently favourable background could not bring child above native ability level.)

6. Girl (10·8). Father: secondary modern teacher.
Stanford-Binet I.Q. 98. Query: 'Reason for failure to secure grammar school allocation, which must adversely affect her whole career: wishes to become a teacher.' All Moray House quotients in range 102-112. Marked signs of strain and anxiety: appears to have received a good deal of home help and to have been strongly impressed with need for grammar school: depressed and tearful; also mother. (Interesting in view of father's position, and his admission that his own school was excellent, its general tone being equal to grammar school. Interesting also because although the father understood the significance of test scores in relation to other pupils, he found it hard to accept that his daughter could not succeed in a grammar school with quotients in the region of 107, which he accepted nevertheless as a fair estimate of her overall ability and attainment.)

It appears difficult to remedy this trouble but four things may help. First, much more use should be made of teachers' records and assessments of progress in the primary school. As will be seen (Chapter XVI) these need not be so unreliable as is popularly supposed. Secondly, there is some evidence from several L.E.A.s, that the first two years common secondary education, with its relatively easy transfer from one type of school to another, is now leading to less disturbance and distress at the possibility of not being placed in the grammar school. Thirdly, the secondary modern schools should be encouraged to present their best pupils for the G.C.E. (ordinary level). Fourthly, parents should be advised and instructed by all the means available not to transfer their anxieties to their children. They can avoid doing so and still remain ambitious and stimulate their children to do their best.

The 11+ selection examination need not follow a too narrow and unchanging pattern. Research has shown that most of the examination methods used up to date can be reliable if carefully administered. There are plenty of methods available to make the examination so varied as not to interfere unduly with the primary syllabus.

There is still need for educational guidance even when the number of comprehensive schools is constantly growing. The heads of such schools have to maintain educational guidance during the pupils' progress through the school. This could best be done on the basis of progress reports on the pupils, but there would continue to be a case for using a verbal reasoning test to make the available information more complete.

(vii) *Secondary School Leaving Examinations*

Competitive examinations were instituted in public and grammar schools in the eighteen-fifties and had so developed by 1900 that three important problems had been recognised. They were :

(*a*) The need to limit the number of external examinations taken in secondary schools and to provide an examination controlled by universities which would satisfy the professions, commerce and industry.

(*b*) The need to provide a competitive examination for entrance to universities.

(*c*) The need to provide a ' leaving certificate ' for the 16-year-old leaver, which would record satisfactory attainment and progress during his grammar school life.

This dual nature of the examinations at the end of the secondary school course, namely, provision of a leaving certificate and of a competitive examination for university entry, continued to occupy educationalists right up to recent times. The School Certificate was to have a dual purpose : firstly, to record the pupil's progress and to test the results of the course of general education up to 16, to follow the curriculum and not to determine it ; secondly, to provide under certain conditions for entry to universities and professions (Matriculation). The second purpose came to overshadow the first,[1] and business houses were soon to seize upon the difference and demand that an applicant should have 'matriculated'. The 1932 Report recommended that the School Certificate examination should be set free from the condition attaching to matriculation so that its real purpose could be better served, that is, to test the secondary school curriculum at the fifth form stage.

At the same time the Higher School Certificate, taken two years after the School Certificate, was becoming more and more recognised as a test of fitness for the university, and so as a means of exemption from Matriculation, Intermediate courses, and as a basis for awarding University Entrance Scholarships.[2]

The Norwood Committee's views on the revision of the School Certificate examination may be summed up as follows. The School Certificate examination should continue to be carried by the existing university examining bodies, but encouragement should be given to schools to offer their own syllabuses. The examination should become a 'subject examination', that is, taken in subjects without the restriction of a minimum number. Investigations should proceed on the best way of keeping and using school records. Ultimately it may have to be considered whether the examination can be made wholly internal.

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[1] Syllabus-based examinations are used in connection with entry to public schools at the end of the preparatory school course. Even here under the pressure of increased competition for entry to public schools the character of the examination has changed somewhat. Originally it was used as a mark of attainment in the preparatory school. Now, however, its results are used for competitive purposes, and the boys scoring higher marks may be more assured of a place in public schools where competition for entry is great.

[2] An interesting account of the examinations conducted by the Joint Matriculation Board is given in *Fifty Years of Examining* by J. A. Petch (Harrap, London, 1953).

These recommendations were followed by the report (1947) on *Examinations in Secondary Schools*, in which it was recommended that

(*a*) every pupil on leaving the secondary school should be provided with a comprehensive school record,
(*b*) objective tests should be set periodically,
(*c*) the possibility of internal examinations should be explored,
(*d*) an external examination be taken at 16.

Ministry of Education Circular 168 put recommendation (*d*) into effect. Recommendations (*a*), (*b*) and (*c*) were referred to in a later circular (No. 205) where local experimentation was welcomed.

By 1952 certain amendments to the original proposals had appeared (S.S.E.C. 2nd Report and M.E. Circ. 251). The fixing of the G.C.E. (ordinary level) at 16 had caused much controversy and strong opposition among grammar school heads. This age limit was rescinded so that younger pupils could take the examination. Also, at the advanced level, normally taken at 18 and used for university entry, it had been recommended that only ‘ passes ’ should be recorded on the certificate. This proved unacceptable to the universities who required more information about applicants for places and it was decided to endorse ‘ distinction ’ marks on the certificate as well as passes.

One other development in connection with the G.C.E. was the institution of a technical subjects panel of the Secondary Schools Examinations Council to consider syllabuses in technical school subjects—engineering, drawing and engineering science. In breaking this new ground the Council may further the basic aim of equalising the status of the different kinds of secondary schools.

It is perhaps a little depressing to see how the reference to school records and internal examinations disappeared. At the same time the original reference to objective tests seems a little inconsistent with the idea that the G.C.E. at ordinary level should merely record a certain achieved attainment.

(viii) *Advantages of the External G.C.E. Examinations*

Hartog and Rhodes asked themselves the question whether examinations should be abolished, and in spite of discovering a convincing array of defects in the examination system they still held firm to the view that examinations were necessary at the end of the secondary school. The value of external examinations is often clearer to those who cannot test the progress of their pupils' work externally. Thus we have the strong feeling in some secondary modern schools that the aimlessness often experienced by all concerned in the secondary modern school could well be removed by some form of external examination.[1] The advantages of, say, the General Certificate of Education are that it gives a clear cut aim for pupils, teachers and parents. Furthermore its external nature gives it an accepted impartiality and objectivity which commends it to employers, parents and pupils, and enables schools to compare their achievements. Employers and professional associations require a universal standard which might not be achieved if pupils were assessed internally. Also, as now constituted, the G.C.E. provides greater freedom for schools and pupils in the variety of syllabuses which may be offered and in the number of subjects taken. Industry and commerce could not dispense with certificates nationally accepted and given by responsible bodies like the universities. Lastly, by coming at the end of the school course, the examination provides a real stimulus for the pupil, placing a premium on powers of attainment, sustained effort and vision.

When we view the G.C.E. examination at the advanced level as a test of fitness for the university, it is seen not to have great advantages over the internal *Abitur* of Germany or the *Maturität* of Switzerland. Internal methods of selection conducted in the main by the grammar school teachers who know the pupils well and who have some liaison with the universities, which would also be represented on the interviewing panel, might provide an improvement on the normal method used for examining at the advanced level of the G.C.E. Such internal methods are suggested in the use of school records (Chapter XVI).

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[1] Many secondary modern schools now offer candidates for the G.C.E. (ordinary level).

(ix) *Disadvantages of the External G.C.E. Examinations*

The International Examinations Inquiry criticised the examinations mainly on grounds of the lack of objectivity and reliability in the marking of essay type examinations. They demonstrated great inconsistencies in the marking of School Certificate history and other subjects. It is difficult, however, to conceive of really useful examinations at this stage in terms solely of new type tests. Our accumulated experience in the use of objective tests at 11+ has shown that great dangers would be possible if similar tests were used for the G.C.E.

Although the examination is intended to follow a syllabus already determined, the converse seems inevitably to come about, and so we have the restricting effect on curriculum, homework, pupil and teacher. The examination takes over control completely, and all that is not examinable tends at best to find a second place and may be ignored altogether.[1] Thus the curriculum tends to be narrowed in content to examinable subjects whereas the creative subjects and extra-curricular material may be neglected. In a similar way methods of teaching are also affected, and we have the often criticised 'subject teacher' attitude which does much to reduce the real aim of education. It may induce excessive cramming on the part of the pupil and so the retention of 'facts' tends to supersede broader objectives. Furthermore the potential successes tend to be segregated and the less able pupils to receive only secondary consideration. Valentine [2] gives some excellent examples of how the teaching of individual subjects may be so thoroughly warped as to lead to no real education at all.

The third main disadvantage lies in the confusion of aims in secondary education. The examination has come to fulfil two purposes, an examination of achievement and a matriculation test for the universities. In our brief consideration of the history of the examination we saw how matriculation needs gradually assumed a dominating influence and also that employers tended to use the certificate of attainment as a competitive test requiring to know 'how well' a pupil passed, and so on. This dominance by university matriculation needs has tended to restrict the subjects taken and also the teaching methods used.[1]

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[1] Valentine, C. W., *The Reliability of Examinations* Ch. 4 (University of London press)

[2] Valentine, C. W., *The Reliability of Examinations* (University of London Press) P. 22

Lastly we may turn to the advanced level of the General Certificate of Education and the Higher School Certificate which was its predecessor before 1951. Here the main question would be how far the examination selects the right students for the university. Several investigations have been carried out. The results are mixed and on the whole not very conclusive, largely owing to sampling difficulties caused by the variety in the relation between subjects taken at the entry examination and in the first year at the university. Williams' results [2] are promising, when we take account of the above factor and the high degree of selection. His correlations, positive between like subjects and negative between unlike subjects, at least indicate tendencies we should hope for. On the whole the results confirm that the best pupils in the schools have got into the universities, a somewhat trite result. The borderline group, however, is not adequately forecast, and Dale [3] recommends further evidence from psychological tests, and school records. On the whole, closer co-operation between schools and universities would seem to be desired.

Suggestions

The function of the G.C.E. (ordinary level) as a record of attainment in subjects is best achieved by the external examination, which should, however, be so conducted as to encourage alternative syllabuses in accepted subjects and new syllabuses for subjects hitherto not examined. The work of the technical panel of the Secondary Schools Examination Council should do much to achieve this broadening of the subject matter, and a clear realisation that the G.C.E. is not directed at university entrance should help the first.

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[1] Valentine, C. W., *Examinations and the Examinee* Ch. 5 (The Birmingham Printers Ltd)

[2] Williams, E. M., 'The Value of Higher School Certificate Results in predicting Performance in First Year University Examinations' *B.J. Ed. Psych.* XX, p. 83, June 1950

[3] Dale, R. R., *From School to University* (Routledge, Kegan Paul, London)

The matriculation element, whether in the form of the advanced certificate or not, might be better conducted along internal lines, using school records, teachers' opinions and even personal examinations along the lines of continental *Abiturs*, Matriculations and *Maturitäts*. These are more in line with the special nature of university study and would effectively separate the two aims of secondary school examinations.

(x) *Reading List*

N.U.T. *Transfer from Primary to Secondary School* Appendices I and II (London, 1949).
Board of Education. *Report on Psychological Tests of Educability* (1924).
Board of Education. Pamphlet No. 63 *Free Place Examinations* (1928).
Board of Education. Consult. Comm. Rep. on the Primary School, 1931 (Hadow Report).
Board of Education. Supplementary Pamphlet No. 63 (1937).
Board of Education. Consult. Comm. Rep. on Secondary Education, 1938 (Spens Report).
Board of Education. *Curriculum and Examinations in Secondary Schools*, 1943 (Norwood Report).
McClelland, W. *Selection for Secondary Education* (University of London Press, London).
Rutter, D. 'The Predictive Value of the Entrance Examination', *Research Review* I, pp. 3-11, 1950.
Peel, E. A. and Rutter, D. 'The Predictive Value of the Entrance Examination as judged by the School Certificate Examination', *B.J. Ed. Psych.* XXI, p. 30, Feb. 1951.
Emmett, W. G. and Wilmut, F. S. 'The Prediction of School Certificate Performance in Specific Subjects', *B.J. Ed. Psych.* XXII, p. 52, Feb. 1952.
Hartog, P. *et al.* *The Marks of Examiners* (Macmillan, London).
Wiseman, S. 'The Marking of English Compositions in Grammar School Selection', *B.J. Ed. Psych.* XIX, Pt. III, 1949.
Finlayson, D. S. 'The Reliability of Marking Essays', *B.J. Ed. Psych.* XXI, Pt. II, 1951.
Ministry of Education. *Examinations in Secondary Schools* Report by Sec. Sch. Exam. Council, 1947.

Ministry of Education. *Examinations in Secondary Schools* 2nd Report, 1952.
Williams, E. M. 'The Value of Higher School Certificate Results in predicting Performance in First Year University Examinations', *B.J. Ed. Psych.* XX, p. 83, June 1950.
Petch, J. A. *Fifty Years of Examining* (Harrap, London).
Brereton, J. L. *The Case for Examinations* (Cambridge University Press).
Dale, R. R. *From School to University* (Routledge, Kegan Paul, London).
Peel, E. A. and Armstrong, H. G. 'Symposium: The Use of Essays in Selection at 11+. II—The Predictive Power of the English Composition in the 11+ Examination', *B.J. Ed. Psych.* XXVI, Pt. III, 1956.

(xi) *Exercises*

1. Outline the difficulties encountered in devising and carrying out a competitive examination for entry to secondary schools.

2. Outline the different purposes served by secondary school leaving examinations.

3. Mark the compositions of a class of pupils by
   (*a*) the overall-impression method
   (*b*) the analytic method (where marks are given and taken away for specific failures in grammar, expression, imagination, etc.).

Compare your results.

CHAPTER XVI

RECORD CARDS AND THEIR USES

(i) *A place for record cards* (ii) *Purpose of record cards* (iii) *Contents of record cards* (iv) *Teachers' estimates* (v) *Allocation of pupils to secondary schools.* (vi) *Record cards and vocational guidance* (vii) *Reading list* (viii) *Exercises*

(i) *A Place for Record Cards*

IN Chapter IX we discussed individual attainments, abilities and interests that are relevant to school work, and in the last chapter we reviewed some of the features and shortcomings of school examinations. We noted that most examinations have as their purpose the distribution of pupils according to their individual differences.

The relatively short examination which takes, as it were, a snap sample of a pupil's abilities and attainments has other disadvantages.

First, it is so brief when compared with the pupil's years of progress in the school that it may miss the changes in his development. Secondly, when used for purposes of selection it takes on the quality of a hurdle which has to be cleared. It may bring about an undesirable build-up in the pupil as a result of his fear of the consequences of failure. Thirdly, the impartiality of the large-scale mass examination consisting of standardised tests may be an illusion and turn out to be mere insensitivity to the emotional differences in the children Underneath the apparent uniformity individuals may be reacting quite diversely with corresponding results in their test performance. Some are confident, others a little shaken, and a few paralysed. In these circumstances the teacher's report of the pupil's customary progress during the primary school years might be of greater value than the examination.

Recognition of these facts and of the need to make the fullest use of the teacher's fairly longstanding acquaintance with his pupils led educationists to suggest that a child's total progress should be recorded by the teacher. This should be done on his *school record card.* Such records are, of course, no new thing, for many heads have long used them for advising pupils on a choice of vocation ; but in the educational reforms following upon the 1944 Education Act it was advocated that records should ultimately supplant single examinations for purposes of selection and guidance. As a result of Hamley's work the National Foundation for Educational Research issued record cards and advice on how to use them.[1] Some Local Authorities followed suit, usually with simpler cards,[2] so that nowadays many make use of these cards for purposes of allocation. They are normally used *in conjunction* with tests and examinations, but as the teachers become more expert in their use and as Authorities become more confident in their predictive efficiency we may expect them in the future to play a much more prominent part than they do now.

The essence of the method is that the teacher records his experience of the qualities and characteristics which distinguish each of his pupils. In order to be able to do this he must be sensitive to the qualities of his pupils and proficient in his knowledge of the theory of marking and ranking. The designer of the card on his side must ask for judgments that contribute to the personality of the pupil, but he must include only those qualities which reveal themselves in the school situation. (See Chapter XIII.)

(ii) *Purpose of Record Cards*

Their general object is to provide more useful information about the pupils than is possible under examination conditions. They are written running commentaries, dynamic and cumulative, of the child's years of school life. This material may be used for information only, or for prognosis, or for diagnostic purposes. It is often customary to prepare a record card for each stage of a pupil's schooling—in the infant school, the junior school and the secondary school. The information on *all* the cards may be used diagnostically, for a knowledge of the child's strengths and weaknesses guides teaching, but each card has in addition a more specific purpose.

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[1] See also Fleming, C. M., *Cumulative Record Cards* (University of London Press)

[2] Northumberland has a recording system which is more comprehensive than most.

The infant school record card is intended for information, mainly to record the child's adjustment to the group life of school which he has newly joined from the security of family protection. It records also his first responses to number and words. So we get a glimpse of his emotional and social development and of his early intellectual showing. Both these pieces of information may be very valuable in case of later failures to develop normally.

The special purpose of the junior school record card is to provide the information needed for allocating pupils to secondary schools. It has to help in educational guidance.

The principal aim of the secondary school card is to furnish details of abilities, attainment, aptitudes and interests that would enable us to advise the pupil about a vocation. Its main objective is vocational guidance.

(iii) *Contents of Record Cards*

What information shall we ask for? This depends upon three things: the facets of personality that are clearly delineated, the special purpose of the particular record card, and what it is feasible to expect a class teacher to observe and record.

The facets of the child's personality include his natural abilities, his emotional and temperamental qualities, his school attainments and his interests We may need also to know something of his physique, health and familial background. Let us now enquire what details about these facets may be relevant for the record cards for the three stages of education.

Infant School

The infant card should contain entries about the child's intellectual powers in so far as the special conditions in the infant school allow. These are normally best estimated by the teacher, although special cases may need to be measured by individual tests or group pictorial tests. Usually infant teachers find it easier to assess their pupils, since regimentation is not so developed as in later stages and the child has developed few inhibitions. We may need an estimate of general intellectual ability and, in addition, as on the record card published by the National Foundation for Educational Research, we may have entries for special intellectual abilities, such as intellectual curiosity, observation, imagination (in connection with stories and acting), inventiveness (in connection with play and manipulative material), and reasoning (ability to solve practical problems and reason in words).

The emotional qualities which it is deemed possible to assess in the infant school are self-confidence, co-operation with adults, co-operation with other children, persistence at school tasks, stability of temperament, and the prevailing general mood (unhappy and listless *versus* happy and adaptable). These qualities are clearly of importance for assessing how the child is reacting to the group life of school. Infant school attainments are not so formal, and the entries are limited to bodily skills and co-ordination, use of language, clarity of speech, drawing, singing and rhythmic work. In the last six months of the pupil's infant school life it may be possible to give details of the standards reached in reading, writing and number.

Comments on the child's interests at the infant school stage are not likely to mean much, but *background* information about home conditions, health, attendance and outstanding qualities *and* disabilities can be of help.

Junior School

The junior school record card has attracted most attention, for its contents bear on the important problem of guidance to secondary schools.

During the junior school years it is possible to test a child's intelligence and attainments objectively, so space is left on the card for the results of objective tests. Teachers' estimates are required for school subjects (attainments) and for special abilities, for apart from verbal and spatial abilities, widely used tests of the special qualities of intelligence have not yet appeared. The abilities which a teacher might be asked to *assess* include verbal ability, reasoning, observation, artistic ability, practical ability and speed—all from his experience of the pupil.

The pupil may have developed regular interests by the time he reaches the end of the primary school and so we should have some note of what may interest him. In the N.F.E.R. record card children's activities and interests have been classified under five headings, intellectual, practical, aesthetic, social and physical.

As we may expect, the temperamental qualities we look for are not quite the same as those recorded in the infant record card. Apart from a note on the prevailing attitude of the child, absorbed in self or highly interested in the world, there are six qualities listed on the card in three pairs. The first pair, self-confidence and self-criticism, concern an attitude to *self*. The second pair, sociability and co-operation, present an attitude to *others*, and the third pair, perseverance and conscientiousness, an attitude towards *work*.

Since in guidance for secondary schools a decision often has to be made in a borderline case and also in a case where a child has potentiality for either a grammar or a technical bias, it is desirable that the pupil's preferences and aims should be known, as well as the views of his parents and the recommendation of his head teacher. There is also need to know if there are exceptional home conditions, and if the child has noteworthy disabilities or bad health.

Secondary School

The contents of the secondary record card are very similar to those of the junior card, but entries relating to school attainments may be elaborated and presented under several headings, including language and literature, science and mathematics, social studies, art and crafts, physical education and other subjects. This is helpful for detecting any special aptitudes which the pupil may possess. Similarly more space is given to the pupil's preferences, aims and interests. Finally the head teacher has to summarise the pupil's school career and relate it to a possible vocation.

(iv) *Teachers' Estimates*

So far we have merely outlined the information we desire about the pupil. We must now discuss the ways of recording this information and their efficiency. It is really a problem of ranking, marking or grading the characteristics we have chosen to describe the pupil. Vernon [1] has written an admirable account of these problems.

How to insure that the teachers' estimates are valid and consistent and how to render them comparable between different schools are the biggest problems for us. In an important article that summarises long experience of teachers' estimates Burt writes : [2] 'For intellectual abilities, and particularly for special aptitudes, the "reliabilities" of teachers' assessments are far lower than that of tests ; for educational attainments it is about equal ; for moral qualities, somewhat better'. Our earlier reference (Chapter XV) to McClelland's investigation showed that teachers' estimates of English and arithmetic were as reliable as and slightly more valid than the other methods of assessing attainment in these subjects. On the basis of his results he recommended a simplified selection procedure which included only an intelligence test and teachers' estimates of the children's attainments.

The Northumberland authority conducted a series of follow-up studies on the pupils selected for grammar schools. Bosomworth [3] has shown that teachers' estimates of primary school attainments, given as single scores, can be improved to become the most efficient predictor of later success. The scaled primary school estimate is obtained as follows. Orders of merit are obtained from the school records of the pupils' attainments in written and oral English, mental and written arithmetic, nature study and social studies. These are then converted to T-scores (mean 50, standard deviation 10), and the average T-score is calculated for all attainments. This is then scaled for difference in average ability between the school group and the county group and for the age-differences of the children.

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[1] Vernon, P. E., *Measurement of Abilities* (University of London Press)

[2] Burt, C., 'The Reliability of Teachers' Assessments of their Pupils' *B.J. Ed. Psych.* XV Pt. II p. 80, 1945

[3] Bosomworth, G., 'Allocating Children to Secondary Schools,' *Educ. Rev.*' Vol. 3, No. 3, 1951

The following table (from further unpublished work by Bosomworth) shows the correlation of the overall attainment of 550 grammar school children with their performance in the grading examination taken two years previously and their scaled primary school record. The figures given are correlation coefficients.

TABLE 24

	Scaled primary record	Grading Examination			
		Verbal I.Q.	Non-verbal I.Q.	English	Arith.
Overall grammar school attainment	·38	·33	·18	·41	·25

When these same earlier performances and assessments are compared with separate grammar school subjects we have the following correlation coefficients.

TABLE 25

Grammar school subjects	Scaled primary record	Verbal	Non-verbal	English	Arith.
English . .	·32	·22	—·01	·36	·36
Foreign Language .	·38	·21	·11	·33	·21
Mathematics .	·33	·31	·18	·25	·37
Science . .	·24	·18	·16	·27	·09
Social Studies .	·35	·30	·14	·32	·18
Woodwork . .	·16	·03	·10	·06	·19
Art . . .	·07	—·02	·22	·05	—·04

These figures again confirm how effective the scaled primary school record is in predicting grammar school achievement.

Bosomworth later obtained further data in which the predictive power of scaled primary school teachers' estimates exceeds that of each of the four components of the grading examination.

TABLE 26

	Scaled primary record	Verbal	Non-verbal	English	Arith
Overall grammar school attainment	·57	·16	·14	·31	·05

All these findings—Burt's, McClelland's and Bosomworth's—confirm that teachers' estimates of school attainments can be most reliable and valid and hence that the school records may be used as first desired. Burt's unfavourable comparison of the reliability of teachers' estimates of special aptitudes with that of tests may be noted but, for all that, there are not suitable tests available for many special aptitudes. His comment on the assessment of moral qualities also needs amplification. Neither teachers' estimates nor tests yield very reliable results, and their validity has not yet received much attention. For this reason many authorities use teachers' estimates of personality only secondarily in the case of borderline candidates.

The Northumberland scaled teachers' estimates are so effective that we may well enquire what are the features of their system. It seems that primary school heads are informed about the later progress of the children who pass from their schools into the grammar and modern schools. The Authority also gives a series of attainment tests at 7+ which help to maintain a sense of perspective between widely different schools. Lastly a system of area panels copes with borderline cases, and the information gathered at these meetings is made available to the heads of primary schools.

School marks and rank orders are frequently used for expressing the teachers' estimates of primary school attainments, but the five-point scale is also used and is almost universally used for assessing character traits. A five-point scale, A to E, is used and the teacher is guided in his allocation of these grades to his pupils by descriptions of the qualities appropriate to each of these five categories. Thus in the 'guide' for the temperamental quality of self-confidence the following descriptive categories are used.

TABLE 27

E. 5% approx	D. 25% approx	C. 40% approx	B. 25% approx	A. 5% approx
Diffident, nervous, lacks self-confidence	Confident only when prepared, otherwise timid	Normally confident in familiar circumstances	Very self-confident, trusts his own powers	Extremely self confident

The percentages refer to the proportion of pupils one would normally expect to find in each grade provided the sample were very large. Often a teacher may have to assess the members of a small class and it is best in such circumstances for him to refer to all the pupils he has experienced and ask himself which of the particular class fall into the different grades. It is also a good plan to envisage a concrete situation calling for the quality being assessed and then to imagine the particular child in this situation. This helps to assess him more easily. The five-point scale is used for estimating emotional and temperamental qualities and for assessing special abilities. It may also be used for school attainments, but here often an order of merit may be drawn up or the examination marks entered. For the other information it is necessary only to record what interests, disabilities, etc., a pupil may possess.

A common snag is that teachers' estimates for diverse qualities of a child's capacities and temperament tend to be too similar. This is called the ' halo ' effect and is due to the fact that the teacher forms an overall general impression of the child and this impression influences the more specialised judgments required on the record card.

It is clear that these judgments of a pupil's abilities, attainments and temperament are not directly comparable from school to school. Where Authorities make great use of record cards it is customary to standardise the teachers' estimates of abilities and attainments. This is done by giving all schools the same test of ability, calculating the mean score for each school, and then scaling the individual assessments in the school appropriately.

It is difficult, however, to standardise the estimates of temperamental qualities, and hence it is all the more necessary that each teacher should draw upon his *whole* experience of all pupils he has taught in order to arrive at his five-point scale. If this is done some generality is approached, and as these assessments are never likely to be used to a greater extent than providing confirmatory evidence for borderline and conflicting cases perhaps we need not do more.

(v) *Allocation of Pupils to Secondary Schools*[1]

There is one method of using teachers' estimates which does not necessitate their scaling for differences between schools. In principle, however, it is similar. This is the *quota system* suggested by Valentine[2] and carried out first in Walsall. The Authority administers an objective group intelligence test and from the results allocates a *number* of grammar school places to each primary school. The head teacher then decides which children from his school will make up the number of places allocated to his pupils. The head teacher may make use of his school records and internal attainment examinations.

A scheme of allocation has been advocated without a mass examination at all.[3] Its essentials are as follows.

The method relies on the fact that the number of children passing from any one primary school into grammar schools remains sensibly constant over a period of a few years. Of course there are large differences between different schools, but this fact is accounted for in the method which consists of two stages.

At Stage I each primary school produces its own order of merit, and divides it, but only provisionally, into three parts : a provisional grammar school list, a provisional borderline list and a provisional modern school list.

The heads of the primary schools may make use of school records or use internal examinations for arriving at their orders of merit. Also the number of children placed in their provisional grammar school lists will be largely determined by the average number of grammar school places which the school has obtained over the period of two or three years preceding. However, the size of provisional grammar school lists is not final as we see when we come to the second stage.

---

[1] In so far secondary education tends to become comprehensive, the actual *methods* described in this section become less relevant. But the *principles* remain constantly important for any guidance within the first two years of the comprehensive school.

[2] Moore, V. J., ' A Method of Allocation used in a County Borough ' *B.J. Ed. Psych.* XVIII Pt. I, 1948

[3] This scheme was first tried out by the West Riding Authority.

At Stage II the children on the provisional borderline lists from a number of schools are now considered together by an impartial panel, and their names are added either to the grammar school or to the modern school list. If neither all nor none, but only some, of the pupils from a particular school are added to the grammar school list then that concludes the business for that school. But if all its borderline pupils are elected to a grammar school it brings forward the next group below them (from its provisional modern school list) for a second round. If none are elected at the first round it brings forward the next group above them (from its provisional grammar school list) for a second round. And so on, for as many rounds as are needed.

It is important at this point to note that if, for a particular school, the borderline is wrongly chosen at Stage I this does not finally affect the fate of any child. What it does is merely to cause more work for the panel—it adds to the number of rounds needed before the provisional lists become final. If, for a particular school, the first round borderline group is of high quality, this does not prevent those below them from being considered ; it merely defers their consideration to a second or later round.

Unnecessary rounds tend to be reduced by fixing the size of the grammar school list according to the school's previous average number of free places.

Two things only are involved in this method : an order of merit from the primary school and an efficient panel for interviewing borderline pupils.

Methods for allocating children to secondary schools are very varied (N.U.T. Report App. I, cited in the last chapter), but I should like to outline the practices of three Authorities which make use of objective tests, school records and special procedures for the borderline cases. These three, together with the quota scheme and the scheme outlined above, give us five methods. They are widely different yet each makes use of assessments and estimates from the primary school.

Let us first return to the Northumberland practice. School records are used in the border zone of children. All children in the eleven-year-old group take the Grading Examination which is designed to assess their mental ability (verbal and non-verbal) and attainment in arithmetic and English by standardised tests. According to each child's total score he is placed in one of three groups :

1. Those children who appear to be eminently suitable for a grammar school education.
2. Those children about whom further information is required before making a decision as to the appropriate type of secondary education.
3. Those who appear to be suitable for a modern school education.

Head teachers are informed in confidence of the names of the children placed in groups 1, 2 and 3. If a child has been placed in group 3 whom the head considers is worthy of a grammar school education, or in group 1 and is considered more suitable for a modern school by his head teacher, the child is nominated into group 2 so that further consideration can be given to his case.

Children finally placed in group 2 are invited to appear before an area panel for interview and further testing. The members of the panel are the grammar school head teachers in the area, the modern school head teachers and representatives of the primary school head teachers. Children are invited to appear before the panel in groups of 12. The tests used at the area panel vary from year to year. They differ considerably from the objective type of intelligence and attainment test. An essay is included as part of the children's work, and in the marking of the essay credit is given to the child with the ability to write correct and fluent English. An oral vocabulary test may be included. The children also take an arithmetic comprehension test which is designed to assess a child's ability to use numbers in solving everyday problems.

When the testing is completed and the marks tabulated, each head teacher in the panel is given a broadsheet indicating particulars of each child's performance at the panel and his order of merit on his scaled school record. An extract of the broadsheet is shown below, together with the final decision taken by the panel.

TABLE 28

	Scaled Primary Record	I.Q. Verbal	I.Q. Non-verbal	English	Arithmetic	Reading	Arithmetic	Spelling	Mental Ability	Essay	Arithmetic Comprehension	Vocabulary	Head Teacher's recommendation	Final decision
1.	58	125	103	103	131	105	122	102	112	5/3/E	2	4	Gram	Mod
2.	64	112	96	130	120	115	108	111	107	9/0/B	20	6	Mod	Gram
3.	58½	117	139	120	109	95	110	92	125	11/6/C	3	3	Mod	Mod
4.	67½	115	103	131	117	124	112	124	111	14/1/B	11	9	Gram	Gram
		Grading examination				7+ assessment				Area panel tests				

Normally most weight is given to the scaled primary school record, the area panel tests and the head teacher's recommendation.

It is necessary to explain the area panel marks in the essay. Scholar No. 1 is recorded as obtaining a 5-3-E assessment in English. This means that there were 5 marks obtained for the use of ideas and of unusually expressive words in the essay; there was a penalty of 3 marks as there were 3 mistakes in grammar, punctuation and spelling, and the rating for fluency was E on a five-point scale.

In another area, which allocates pupils to grammar schools and technical schools at the same time, verbal and non-verbal tests are first given, and then objective tests in arithmetic and English follow, together with an English composition. The test in English is a compromise between the narrowly restricted objective test involving underlining only, and the free responses of the ordinary school examination. On the basis of verbal intelligence and the English and arithmetic total scores, a group of children is selected for the grammar and technical schools, and these are then divided according to the scores they have obtained in the verbal and subjects tests and according to the recommendation of their head teacher and any wishes the parents may express.

The borderline group is selected on the grounds of borderline scores in the total performance in the objective tests forming the first part of the examination, on the grounds that the essay was not up to the minimum standard required of a grammar and technical school entrant, and thirdly, on the grounds of anomaly between performance in Part I and the head teacher's recommendations from the record cards resulting from illness or any other exceptional circumstances at the time of the first part of the examination. The borderline cases, numbering roughly 50 children of each sex, are given a special examination of an individual kind, involving problem tasks and also an assessment of their interests.

After completing this material each child goes to the interviewing panel, consisting of a grammar school head teacher, a primary school head teacher, and the educational psychologist and selection officer. The panel has before it primary school records, a record of the child's performance in Part I, the composition he wrote, the result of the short test taken immediately before the child is interviewed, together with any other relevant information such as the special recommendation of the child's primary school head. On the basis of this interview the panel allocate the children into three classes, A, B and C: A are suitable for the grammar school and technical school; B are doubtful; C are definitely unsuitable. The short test taken before the panel meets is not scored separately, but the panel is asked to take this score into account when the grading for suitability is made. It is clear that in this practice, primary school records are used first to help determine whether a child is going into a grammar or a technical school and secondly, to determine whether borderline candidates are suitable for grammar schools or not.

In yet another area, selection for the grammar schools is made on the basis of objective tests in intelligence, English and arithmetic, in conjunction with an examination in English composition and with primary head teachers' records of the children's school attainments in English and arithmetic. The same school records include also assessments of the children's perseverance and stability. The child's performance in the three objective tests is totalled and this determines the first order for the recommendations for the grammar schools, and usually a dividing line between those suitable and unsuitable for grammar schools is between 115 and 120 mean I.Q. score.

A supplementary list is drawn up, giving the scores of children down to a mean score of about 105, and then the other information is reviewed for borderline candidates. This includes primary school record assessments on a five-point scale of English and arithmetic attainment, together with a five-point assessment for the qualities of perseverance and stability. The board does not see these borderline children personally, but if any doubt still remains after discussion of the cases, then the Authority's educational psychologist interviews and may test the child further, using individual material. The English composition is used in this area to set a minimum level of attainment. The compositions are marked 'satisfactory' or 'unsatisfactory', and, no matter what the objective test scores are, a child who has written an unsatisfactory composition has to be reviewed as a special case and may be called upon to write a further composition later in the year.

There is a growing tendency for a head teacher's estimates of the pupils' progress in his primary school to be combined with their score on a verbal reasoning test for purposes of selection to secondary schools. As we saw in the previous section, the tendency to depend on primary head teachers' assessments is well founded, from the results of much research.

A typical way in which these two pieces of information may be used for the purpose of selection is as follows. First, the head teachers are asked to rank the pupils according to their suitability for secondary education. The list is divided into three parts : the first containing those most likely to benefit ; the second containing a reserve list ; and the third those more likely to benefit from non-selective education. This list is made up by the head teachers without any knowledge of the pupils' performances on the verbal reasoning test. This latter is then given and where it yields discrepant results from the head teachers' assessments, further consideration is given to the case of each individual child concerned. The head teachers are helped in drawing up their lists by being told of the performances of previous years at their schools. This is not a final restriction but it safeguards excessive or inadequate claims.

(vi) *Record Cards and Vocational Guidance*

Most pupils take up a job on completing their secondary education. The routes into employment are various—many pupils find jobs without the help of head teachers, many are helped directly by the heads and many need to seek the advice of Youth Employment officers.

Apart from those who do not ask for help to find a job and do not require references if they change jobs, most secondary school pupils need to refer to their head teachers. Secondary school records have two uses ; first to help the head directly for giving advice and references, and secondly for passing on relevant information about the pupil to the Youth Employment officer. One cannot overstress the need for full liaison between heads of secondary schools and Youth Employment officers. The final purpose of the secondary record card is only achieved when its information has reached those responsible for finding employment for the young person.

We have briefly outlined the information thought desirable on the secondary school record card. Now let us look at the problem from the point of view of the Youth Employment officer. All that we need is set out in a publication of the Central Youth Employment Executive, C.Y.E.E. Memorandum No. 9 *The Technique of Vocational Guidance.*

For our purposes we may assume that the officer knows all about the requirements for different occupations and the supply and demand of workers and industry. His important task is to collect information about the young people he has to advise.

This is done by the *seven-point plan.* The seven heading are: physical make-up; attainments and previous experience; special aptitudes; interests; disposition; general intelligence; circumstances. The seven points are elaborated further as follows:

1. *Physical make-up.* Has he any physical defects or disabilities of occupational importance? How impressive are his appearance, bearing and speech?
2. *Attainments (and previous experience).* What type of education has he had? How well has he done educationally? What occupational training and experience has he had already, if any? How well has he done occupationally?
3. *General intelligence.* What is the level of his general intelligence? How effectively does he use it?
4. *Special aptitudes.* Has he any marked aptitude for understanding mechanical things? Is he good at doing jobs with his hands? Does he express himself easily, in speech and in writing? Is he good at figures? Does he draw well? Has he musical talent?
5. *Interests.* Has he intellectual interests? Practical-constructional? Physically-active? Social? Artistic?
6. *Disposition.* How acceptable does he make himself to other people? Does he influence others? Is he steady and dependable? Is he self-reliant?
7. *Circumstances.* What are his economic circumstances? What do the other members of the family do for a living? Are there any special openings available to him?

The memorandum continues on the contribution of the teacher.

> 'Most important also is the contribution which the teacher can make both through the confidential school report and in supplementary conversation. In seeking the help of a teacher the vocational guidance officer will

> sometimes find it desirable to emphasise two points. First, what is needed chiefly in a report on a boy's attainments is some indication of his standing in relation to the standing of other boys of his age in the same school. Secondly, it is undesirable that marked weaknesses should be overlooked because neglect of them may lead the adviser to give unsound guidance.'

It is clear that most of the information sought by the Youth Employment officer under these seven headings should be in existence at the end of the pupil's school career. Furthermore, the spirit of school records is fully compatible with the quotation made in the preceding paragraph.

The report has a word of caution to say about the use of objective tests. Apart from tests of general intelligence the authors consider that objective tests of special abilities and aptitudes are limited in value. It appears that there is no minimum level of intelligence necessary for any job. The level may change and it all depends on supply and demand for workers. However, here the value of the school record is again demonstrated, for sound test information about the pupil's ability and attainments are available on the cards. The relation between intelligence and school attainment is also relevant, for as the individual grows older it is more valid to distinguish his intellectual capacities from the use he makes of them. Thus, as stated in the memorandum,

> 'Some very bright people do not make good use of their intelligence, and some rather dull people make excellent use of their limited endowment. It is therefore desirable for the adviser to discover, mainly from teachers, whether a boy is in the habit of using his intelligence above, below or at the level indicated by his intelligence test score.'

Here then we have a brief summary of the main facts about vocational guidance as it affects the schools. Two things stand out clearly: the need for liaison among schools, Youth Employment officers and employers, and the value of the entries on the secondary school record card.

(vii) *Reading List*

Fleming, C. M. *Cumulative Records* (University of London Press).

National Foundation for Educational Research. Handbooks and Record Cards for the Infant, Junior and Secondary Schools.

Vernon, P. E. *Measurement of Abilities* (University of London Press).

Burt, C. 'The Reliability of Teacher's Assessments of their Pupils', *B.J. Ed. Psych.* XV, Pt. II, p. 80, 1945.

Bosomworth, G. 'Allocating Children to Secondary Schools', *Educ. Rev.* Vol. 3, No. 3, 1951.

Central Youth Employment Executive. *The Technique of Vocational Guidance* Memorandum, No. 9, April 1949.

Rodger, A. 'Vocational Guidance in Britain', Ch. II in *Current Trends in British Psychology*, Mace, C. A. and Vernon, P. E. (eds.) (Methuen, London).

Burt, C., Alexander, W. P., Moore, V. J., Bradford, E. J. J., Dempster, J. J. B., Peel, E. A., Lambert, C. M. and Rodger, A. 'Symposium on the Selection of Pupils for Different Types of Secondary Schools', *B.J. Ed. Psych.* XVII-XX, 1947-50.

(viii) *Exercises*

1. Outline and justify the headings you would make for record cards intended

   (*a*) for educational guidance into secondary schools at 11+

   (*b*) for the information of youth employment officers.

2. If you are asked to rate your pupils for stability, conscientiousness and sociability, what school situations, in the classroom or elsewhere, would you keep in mind? Give three examples in each case.

3. What is the strength and weakness of teachers' records of their pupils? What steps would you take to reduce the inaccuracies of such records?

EPILOGUE

WE may now return by retracing our steps to the purpose of education defined in the first chapter. Our aim was to develop a well-integrated person, capable of exercising such responsibility in society as his powers allow.

Teacher and pupils are members of this society and both are involved in the growth of responsible citizens. The social implications of these facts would alone establish a place for social psychology, but in addition the teacher and his pupils form a small world within a world, in which the teacher's role is that of leader. Effective leadership makes for and turns on the morale of the group, and hence the need to study the individual in society, the forces of group life and communication is central to our problem. We have therefore studied attitudes, both as frames of reference and as socially learned products, and outlined a theory of social learning.

As we retrace our path towards the beginning of our study we next come upon the problems of development, intellectual and emotional, and lead up to the mature personality. Reasoning grows from fragmentary sensori-motor response and intuition to the complete operation of thought. Emotional growth can be viewed as the emergence of less selfish, immediate responses to an ever widening range of stimuli which impinge less directly on the individual. The mature person is aroused by the infringement of principles and values and knows his own place in the order of things.

At any age the differences which characterise individual persons are extremely varied. A study of these differences helps the teacher in grading his work and the selection officer in placing children in suitable schools. It also gives rise to theories of intellectual and emotional structure. The applications of facts and theories about individual differences are varied and took us finally in the last two chapters into the realms of examinations and school records.

The purpose of teaching is learning. In the first place the learner responds to changes in his environment and we inquire into the conditions under which such responses are learned.

Then we consider the complexities of human responding which lead to meaningful conceptual and constructive learning. Learning can also be analysed in terms of the experiences and insights of the learner. The motivation of learning is as complex as the act of responding and is set off by a wide range of drives and urges.

We are now back where we started—at the pupil learning to become and developing into the citizen. The science of this growth must therefore take *full* account of the child. Our science of education, the psychological basis of education, is therefore centred on the study of the pupil.

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